

Environmental Protection Plan

**Project 31-09 PHG: Grading 30.0 km of Route 500, Trans Labrador Highway,
Cartwright Junction Towards Happy Valley - Goose Bay,
KM 645.9 to KM 675.9**

Station 158+220 to Station 184+000

May 6, 2009

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ENVIRONMENTAL PROTECTION PLAN

May, 2009

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SECTION 1 – INTRODUCTION

This Environmental Protection Plan (EPP) has been produced by the Department of Transportation and Works (DTW) and represents commitments made in the Trans Labrador Highway (Goose Bay to Paradise River) Environmental Impact Statement (EIS) and Comprehensive Study Report (CSR), January 2003, and Addendum, October 2003 and Supplementary Addendum, March 29, 2004.

DTW registered the project with the Department of Environment on April 3, 2002 for review under the Environmental Protection Act and Regulations. Applicable permits, authorizations, and approvals are required for the project prior to the start of work.

This Environmental Protection Plan is a concise field usable document that describes detailed site specific environmental protection measures to be implemented during the preconstruction, construction, and post construction phases of the project. It has been prepared to assist DTW in the supervision of field activities and as a guide for decision making in the field. The EPP will also be of interest to federal, provincial and municipal government personnel, aboriginal groups, organizations, and members of the general public who wish to know how construction and operation activities will be managed to prevent or minimize potential negative environmental impacts.

This EPP pertains to the construction of 30 km of the section of two lane gravel surface highway extending from km 158+220 to 184+000 starting from Cartwright (end of project 05-08 PHG). This section is also referred to as *Station 158+220 and 184+000*, respectively, within the contract documents. The use of "Owner" in this document is synonymous with DTW as this facilitates the direct incorporation of specific environmental protection measures in contract documents.

SECTION 2 - GENERAL PROTECTION MEASURES FOR CONSTRUCTION

2.1 Owner's (DTW) Policy

It is Owner's policy to protect the environment along the route of the project, in areas adjacent the route, and in associated work areas such as pit or quarry sites. DTW is committed to appropriate and cost effective environmental protection measures that will prevent serious or irreversible environmental damage through the planning and implementation phases of the project. DTW is committed to implementing best practices consistent with the Precautionary Principle (1992 Rio Declaration on Environment and Development), to avoid adverse effects where possible.

DTW uses various environmental planning elements which comprise an Environmental Management Plan (EMP). These elements provide the means for DTW and their Contractors to implement and monitor environmental protection measures. DTW will implement the elements of the EMP throughout the construction phase and will continue best practices throughout operations. The elements common to an EMP (pre-construction planning,

contingency plans, environmental specifications, monitoring plans, rehabilitation plans, and Contractor environmental awareness and training) are incorporated into DTW's Environmental Protection Plan.

To ensure protection of the environment, the work at all times shall be subject to inspection by the Owner and staff of relevant, provincial and federal agencies. Normally, all inspections other than by the Owner will be arranged in advance through the Owner. Any specific matters relating to environmental protection will be dealt with between Contractor and Owner. The EPP will be included as a Supplementary General Condition (SGC) of the Owner's Tender Book. The Owner's Specification Book forms part of the Tender Book. **Where there is a difference in the requirement(s) of the EPP and the Specification Book of the Owner, the EPP shall override the Specification Book.**

Any violations of environmental permits or authorizations or any environmental related incidents which are observed by inspectors representing regulatory agencies or other environmental officials are to be reported by them prior to leaving the site to the Resident Engineer of the DTW. In the absence of the Resident Engineer the matter shall be reported to the DTW Environmental Planner (EP) or in the absence of the EP to a DTW official who is designated by the Resident Engineer.

Except in emergency situations, environmental protection measures required by other agencies must be approved by the Owner prior to implementation by the Contractor.

2.1.1 Owner's Responsibilities

The Owner shall ensure that all environmental protection measures which are part of this contract are adhered to by the Contractor. The Owner shall ensure the Contractor obtains all necessary regulatory permits and approvals prior to specific work activities and that the terms and conditions of all regulatory permits and approvals are followed. Compliance will be ensured through regular inspections of construction sites by the EP/Resident Engineer. Non compliance could result in legal action against the Contractor by regulatory agencies and/or hold back of payment owing by the Owner.

2.2 Environmental Reporting

The DTW will have an Environmental Planner (EP) who will act as the liaison between DTW and regulatory bodies responsible for environmental protection. The EP will liaise with the Resident Engineer of DTW to whom the contractor will report and also with the Innu Nation Environmental Monitor (see Environmental Management and Reporting, Appendix A). The Resident Engineer represents the Owner and has complete authority over all aspects of project work.

The role of the DTW EP will be to evaluate the environmental activities of DTW and the contractor, as well as to assess and interpret environmental protection measures as outlined in the EPP, regulations, guidelines, permits, approvals, letters of advice, and authorizations. The DTW EP will advise construction management of environmental procedures and requirements, participate in project meetings, conduct environmental reviews of drawings and play a major role in the development and revision of the EPP. The DTW EP will prepare a yearly monitoring summary report for each of the contracts. The Environmental Assessment Division, Department of Environment and Conservation, will be supplied with a copy of each report and will distribute as needed to other interested agencies.

The Labrador Innu Nation will also have an environmental monitor on site throughout the construction season. The role of the Innu Nation Environmental Monitor will be to interpret the EPP, monitor all sub-contractor activity to ensure conformance with the EPP, regulations, guidelines, permits, approvals and authorizations, and to advise DTW engineering and environmental personnel. He/she will also be in possession of the EPP, environmental compliance and effects monitoring reports and incident reports (i.e. hydrocarbon spill reports), participate in project meetings, conduct environmental reviews of drawings, and assist in the development and revision of the EPP. The Innu Nation Environmental Monitor will communicate with the DTW EP and will take direction from his/her leadership. (See Appendix A)

DTW will meet with the Innu Nation representatives in advance of each construction season to facilitate a suitable liaison and develop appropriate mitigation measures pertaining to Innu resource use.

2.2.1 Compliance Monitoring

This is a process whereby DTW will conduct monitoring to ensure compliance with the EPP, regulatory requirements, conditions of approvals, permits, letters of advice, authorizations, and environmental commitments through regular inspections of construction and operational activities.

The overall responsibility for DTW's compliance monitoring will rest with the Resident Engineer. The Resident Engineer will also be responsible for the day to day field monitoring and for ensuring that the EPP specifications are enforced and implemented by the Contractor. The EP will assist the Resident Engineer in these areas.

The DTW Specification Manual (Transportation) will be used as a basis to monitor compliance in the area of engineering and management. In regard to Environmental Specifications the Contractor is referred to Division 8 of the Specification Manual, General Environmental Requirements. All other relevant divisions and sections will apply. (See Appendix B).

Through general effects monitoring DTW will determine if impacts occur and if so, do they occur at predicted levels. Effects monitoring will provide a measure of the validity of the predictions and provide a means of assessing and re-evaluating whether or not mitigation has achieved its purpose.

DTW will conduct periodic inspections of borrow sites and stream crossings. The Contractor's warranty for the rehabilitation of borrow sites will be in accordance with the tender book document.

During the full construction period of the project, DTW will monitor and record any incidents pertaining to wildlife, migratory birds, and fish and any incidents or matters pertaining to soil and water contamination.

2.3 Contractor Education

The DTW will conduct a mandatory Environmental Awareness Session for each Contractor and his employees including subcontractors prior to construction during core working hours

at a time and location selected by DTW. The session shall include a review of the environmental protection measures outlined in the EIS and other related mitigation. Also, the session shall have information respecting Innu presence in the project area and their privacy as well as direction to not interfere with Innu fishing and hunting activities. Members from DFO will be invited to participate in the Awareness Session to emphasize measures to protect fish and fish habitat. Environmental training of the Contractor's and subcontractor's personnel coming on staff after the environmental awareness session will be the responsibility of the Contractor. The Resident Engineer/EP will monitor this provision.

2.4 Contractor's Responsibilities

The Contractor shall ensure that its employees and Sub-contractors comply with the conditions of the contract and with all applicable environmental laws and regulations of the various government authorities. The Contractor shall also ensure that such other rules and regulations as the Owner may establish for all work pertaining to this project within or outside of the road right of way are followed.

The Contractor may be required to obtain all or some of the following permits where such are required. These are outlined in the following table:

Table 1; Major Regulatory Approvals

<p style="text-align: center;">MAJOR REGULATORY APPROVALS BY TYPE, AGENCY AND CONTACT PERSON</p>

TYPE OF PERMIT	AGENCY	CONTACT PERSON
1. Stream Crossings Letter of Advice *	Dept. of Fisheries and Oceans	Ms. Kathleen Simms 896-6151
2. Wood Cutting & Burning Permits	Forestry Division Dept. of Natural Resources	Ford Taylor 896-3405
3. Fuel Storage/Handling & Solid Waste Disposal	Government Services Centre	Mr. Rick Curran 637-2229
4. Water Supply, Solid Waste & Sewage Disposal	Government Services Centre	Ms. Sharon Metcalf 896-2661
5. Quarry or Pit Operations	Dept. Of Natural Resources Mineral Lands Division	Mr. Fred Kirby 729-6447
6. Navigable Waters Protection Act Approvals*	Canadian Coast Guard	Mr. Dan Shea 772-7563
7. Contractor Designed Stream Crossings	Dept. of Environment and Conservation, Water Resources Management Division	Mr. Robert Picco 729-2563
8. Stream Crossings*	Dept. of Environment and Conservation, Water Resources Management Division	Mr. Robert Picco 729-2563

* Approvals obtained by DTW.

The Contractor shall obtain all other permits and approvals which may be necessary to comply with government laws and regulations. Prior to the commencement of specific work elements, the Contractor shall immediately provide the Resident Engineer with two copies of all permits as they are obtained.

The Contractor is referred to the following **Environmental Guidelines** regarding construction procedures at watercourses, copies of which may be obtained from the Department of Environment and Conservation, Water Resources Division:-

Chapter	Title
3	Watercourse Crossings
4	Bridges
5	Culverts
6	Fording
7	Diversions, New Channels, and Major Alterations
9	Pipe Crossings
13	General Construction Practices

The Contractor is also referred to the Department of Fisheries and Oceans “Fact Sheets”, in Appendix C, regarding in-stream work and fish habitat protection.

2.5 Numeric Standards

In any instances where, in the EPP, specific numerical criteria are provided, the abbreviation NS for NUMERIC STANDARD (NS) will appear in the left hand margin of this EPP. This is provided to alert all readers that for those items specific numeric standards will form part of the contract documents between Owner and Contractor.

2.6 Contractor and Subcontractors' Personnel

The Contractor and Subcontractors’ personnel shall not harass wildlife, migratory birds or fish. **Fishing, hunting and trapping is prohibited by contractor/employees and department staff on the route of Phase III.** All trash has to be contained and littering will

not be tolerated. This includes lunch refuse, grease tubes, oil containers, etc. What is brought into the field has to be brought back out. Littering falls under the Waste Disposal Act of the Department of Environment and Conservation. Any contravention of environmental requirements or government regulations, including employee actions accidental or otherwise, resulting in environmental damage shall be reported to DTW and the appropriate regulatory authority without delay. The Contractor shall be responsible for all costs associated with clean-up, and/or restorative measures as may be directed by DTW, or by provincial or federal agencies through the Owner.

2.7 Storage, Handling and Transfer of Fuels and Other Hazardous Material

(A) Special Procedures In the Event of a Hydrocarbon Spill

NS All spills are to be reported directly to the EP/Resident Engineer and in the event of the detection of a fuel or hazardous material spill of **70** liters or more the Contractor and Subcontractors shall abide by the following measures:

- (i) make every effort to stop leakage and contain contaminant flow;
- (ii) **immediately** upon detection, report spill location and size to the Canadian Coast Guard spill report number **772-2083** or **1 800 563-2444** and the Resident Engineer/EP, and to the Department of Fisheries and Oceans at **896-2661**; follow up with a full written report containing information on the cause of the spill, remedial action taken, damage or contamination estimate, and any further action to be taken;
- (iii) remove contaminant from spill site by absorbent, pumping, burning, or whatever method is appropriate and acceptable to Owner. Clean-up the affected area in accordance with the requirements of the Government

Services Centre and then dispose of contaminated debris at an approved waste disposal site.

- (iv) take all necessary action to ensure the incident does not recur.

It is required for all spills regardless of volume that may enter waters frequented by fish to be reported to the Spill Line 709 772-2083 or 1 800 563-9089.

Contractor shall apply the following criteria in reaching decisions on contaminant and clean-up procedures:

- (i) minimize danger to persons;
- (ii) minimize pollution to watercourses and wetlands;
- (iii) minimize the size of the area affected by a spill; and
- (iv) minimize the disturbance to the area and watercourses during clean-up.

The above procedures shall also be followed in the event of a spillage of less than 70 liters excepting that a spill of this magnitude is not required to be reported to the Canadian Coast Guard. Any spillage of hydrocarbon product must be reported immediately to the Resident Engineer or the EP, and copied to the Innu Nation Environment Monitor.

A portable oil-containment kit consisting of hydrocarbon-resistant liner and absorbent has to be available for temporary collection of hydraulic fluids, fuels, hydrocarbons, and antifreezes that leak from equipment breakdown in the field. The absorbent will have to be disposed of in the same manner as a hydrocarbon spill.

(B) General Procedures for Storing and Handling Fuels

- (a) Bulk fuel storage and hazardous materials will not be permitted in the vicinity of any

- watercourse or water body [See Section (e)]. The Contractor shall consult with the EP and Resident Engineer for approval of site locations for fuel storage. The Contractor, Subcontractors, and their personnel shall take all necessary precautions to prevent the spillage, misplacement, or loss of fuels and other hazardous material.
- NS (b) All storage tank systems must be registered under and in compliance with Newfoundland Regulation 58/03, The Storage and Handling of Gasoline and Associated Products Regulations, 2003 before commencing operation. Registration does not apply to storage tank systems of a capacity less than 2500 liters that are connected to a heating appliance. Contractors shall supply verification of storage tank registration to the Owner prior to the commencement of work.
- (c) The Contractor shall ensure that fuels and hazardous materials are handled only by personnel who are trained and qualified in handling these materials in accordance with manufacturers' instructions and government regulations. The Contractor will be required to verify personnel qualifications as they pertain to this item and provide written confirmation of same to the Resident Engineer.
- (d) Refueling operations shall be supervised at all times. Under no circumstances shall any refueling procedure be left unattended by the operator.
- NS (e) Oils, greases, gasoline, diesel, hydraulic and transmission fluids or other fuels shall be stored at least **100 m** (horizontal distance) from any watercourse, water body, or wetland unless otherwise approved by the Owner.
- (f) Handling and fueling procedures shall be carried out to prevent the contamination of soil or water.
- NS (g) All above ground fuel containers, with the exception of those exempted under Newfoundland Regulation 258/82, shall be self dyked units that are in compliance with the terms and conditions of the approval of the Government Services Centre.
- (h) Fuel storage areas and non-portable transfer lines shall be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers

shall be visible under all weather conditions.

- (i) **Waste oils and lubricants shall be retained in a tank or closed container, and disposed of by a company licensed by the Government Services Centre for the handling and disposal of waste oil products. Disposal of waste oil and lubricants in an unauthorized manner, such as at borrow sites, is strictly prohibited. Abandoned or temporary containers of hydrocarbons, such as oil buckets, hydraulic fluid containers, grease tubes, etc., may not be stored or placed anywhere along the right of way of the TLH regardless of proximity of water courses. Where waste oil or partially used oil containers are transported by truck, secondary containment such as a larger container shall be used as long as that container is leak-proof, organic solvent resistant, and capable of holding twice the volume of the container shipped. A 5 gallon bucket will suffice for grease tubes.**
- NS (j) Storage tank systems shall be inspected on a regular basis as per Section 20 of Newfoundland Regulation 258/82 Storage and Handling of Gasoline and Associated Products. This involves, but is not limited to, gauging or dipping, reconciliation of records, and the proper maintenance of reconciliation records for a period of two years. Records shall be maintained for inspection by the Resident Engineer, EP and/or Government Service Centre Inspectors.
- NS (k) Any maintenance such as hydraulic line repairs or similar work shall be carried out by using suitable fluid collection equipment and in a manner which ensures all waste material is collected and suitably disposed of. The Contractor shall ensure that all equipment is mechanically sound to avoid leaks of grease, oil, diesel, gasoline, and hydraulic and transmission fluids. **A maintenance clean-up kit consisting of absorbent material as well as a drip tray/lining shall accompany every piece of machinery.** The Contractor shall ensure that no servicing or washing of heavy equipment occurs within **100 m** of a watercourse or designated wetland except

within a refueling site approved by the Owner. Such a site will provide containment for accidentally spilled fuels and ensure proper disposal of all waste oil, filters, containers or other such debris in a manner approved by the Government Services Centre.

- NS (l) Smoking shall be prohibited within **10 m** of a fuel storage area or during refueling operations.
- NS (m) Fueling or servicing of mobile equipment shall not be allowed within **100 m** of a watercourse, water body, or wetlands.
- NS (n) The owner of a storage tank system shall, within **30 days** of known abandonment, empty the system of all product and vapors, remove the tank and associated piping from the ground, remove any contaminated soil, clean the area and restore the site to the satisfaction of the Owner and in accordance with the criteria of the Government Services Centre. The Contractor shall dispose of any soil contaminated by hydrocarbons or other chemicals in a manner approved by the Owner and in accordance with the criteria of the Government Services Centre.
- (o) The Contractor shall have on site suitable oil spill response equipment including a sufficient quantity of absorbent material, empty barrels, an oil boom, skimming equipment, and all other necessary items to effectively and quickly respond to any spillage of hydrocarbon product on water or land. The Contractor shall advise fuel handling staff of the location and application of the oil spill response equipment. The Contractor must advise the Resident Engineer and EP of the location and quantity of materials and response equipment available.
- (p) No pesticides or other toxic chemicals shall be used without prior approval of the Owner. Each chemical to be used, its application, restraint, and area of use shall be subject to regulations under Part IX of the Environmental Protection Act, and
- NS Newfoundland and Labrador Regulation 57/03, the Pesticide Control Regulations, 2003. A copy of the Material Safety Data Sheet (MSDS) shall be supplied to the

Resident Engineer, and copied to the Innu Nation Environment Monitor **5 days** prior to any use by the Contractor. Two copies of any approval issued to the Contractor for chemical usage under these Regulations shall be provided to the Resident Engineer, and copied to the Innu Nation Environment Monitor.

- NS (q) Toxic construction material such as treated timber shall be stored at least **100 m** away from all areas where drainage is directed into any of the waterways or wetlands within this contract.

2.8 Waste Management

The Contractor shall collect and dispose of all waste produced by its employees and those of its Subcontractors in a manner approved by the Owner and the Government Services Centre and as outlined in Part IV of the Environmental Protection Act. **Littering along the right of way by employees of contractors or any visitor will not be tolerated and will be dealt with under the Waste Disposal Act of the Department of Environment and Conservation. This includes lunch packaging. What is brought into any working site, including survey lines, has to be brought back out.** All efforts must be made to utilize best waste management practices toward the reduction, reuse, and recycling of waste products and surplus material. No waste material shall be deposited in any watercourse or wetland. Rubbish and domestic garbage generated by the Contractor's employees shall be collected and temporarily stored in suitable containers which are not accessible to scavenging by bears. Such containers shall be emptied frequently and the contents transported and disposed at the Waste Disposal Site with the permission of the community of Cartwright or Port Hope Simpson. Any incident at the construction site involving wildlife such as bears or wolves shall be immediately reported to the Resident Engineer/EP, Innu Nation Environment Monitor, and the Wildlife Division Office at Goose Bay (896-5107).

Unsuitable material (USM) which is not used on the project in fills shall be the Contractor's responsibility for disposal. The material shall be placed and stabilized in a manner and at a location acceptable to the Resident Engineer and EP.

2.9 Dust Control

The Contractor shall ensure that dust does not become a problem for workers on the project.

Water shall be used by the Contractor to control dust when necessary or as requested by the Resident Engineer/EP.

2.10 Water Quality Monitoring

The Resident Engineer and EP will carry out visual monitoring of watercourse crossing sites and down stream areas when construction of watercourse crossings are underway to ensure that the Contractor's construction procedures and methods of operation are not resulting in pollution and/or siltation of adjacent or downstream areas.

2.11 Marshaling Yards

NS **Marshaling yards for equipment and material storage yards shall be located a minimum 100m from any watercourse, waterbody or wetland.** The site should be of low value with respect to its potential for other uses when compared to other lands in the area. Abandoned gravel pits, non-forested areas, or other previously disturbed areas are preferred

locations. Prior to the commencement of construction the Contractor will submit a list of candidate sites, which will be reviewed and approved by the Owner and any other relevant agency. Marshaling yards shall be rehabilitated and dealt with in a similar manner as described in Section 2.17 Borrow Areas, including hydroseeding.

2.12 Protection of Historic Resources

DTW will hire an archaeological consultant prior to construction to survey the route. The detailed contract drawings will be used to determine the road right of way. The Contractor shall be aware that the Provincial Archaeology Office of the Dept. of Tourism and Culture, requests that all parties involved with fieldwork be advised on the provisions of the Historic Resources Act (1985) protecting archaeological sites and artifacts, and procedures to be followed in the event that either are found:

Section 10 (1) - A person who discovers an archaeological object in, on, or forming part of the land within the province shall report the discovery forthwith to the Minister stating the nature of the object, the location where it was discovered and the date of the discovery.

Section 10 (2) - No person, other than the one to whom a permit has been issued under this Act, who discovers an archaeological object shall move, destroy, damage, deface or obliterate, alter, add to, mark or in any other way interfere with, remove or cause to be removed from the province that object.

Section 11(1) - The property in all archaeological objects found in, on, or taken from the land within the province, whether or not these objects are in the possession of Her Majesty is vested in Her Majesty.

Should any archaeological remains be encountered, such as stone, bone or iron tools, concentrations of bone, fireplaces, house pits and/or foundations, all work in the area of the find shall cease immediately and contact shall be made with the Resource Archaeologist (729-2462) as soon as possible. Due to the interest of the Innu Nation in archaeological resources in the project area, the Innu Nation (497-8155) shall be contacted quickly and also

informed of any discovery.

The Owner through the Resident Engineer/EP shall be notified immediately upon discovery of any historic resources.

2.13 Temporary Work Camps

The Contractor is responsible for obtaining all appropriate permits from government agencies with legislation and regulations relevant to overnight lodging and camp facilities. These permits include but are not necessarily limited to those related to solid and liquid waste disposal, water supply, sewage treatment, development control and Crown Lands.

The area to be cleared for temporary construction camps shall be minimized and existing cleared areas shall be used whenever possible. Stripped surficial soils shall be stockpiled for later use in site rehabilitation.

NS Camps shall not be permitted within **100m** of any watercourse or designated wetland unless otherwise approved by Owner.

When camps are no longer required all trailers, materials, and debris shall be removed and rehabilitation of the site shall be carried out in a similar manner as detailed in Section 2.17 Borrow Areas. Monitoring of the sites to confirm satisfactory revegetation will be conducted.

Temporary construction camps which propose to utilize an adjacent watercourse as a source of potable water should design and install the freshwater intake in accordance with DFO's "Freshwater Intake End-of-Pipe Fish Screen Guidelines" dated March 1995, to prevent potential losses of fish due to impingement. When pumps are placed in water courses for unwatering purposes, it is imperative resident fish are removed prior to placement of the pump apparatus. Fish will hide under stones and woody debris found in natural streams

therefore it is important all reasonable effort will be taken to search for and remove fish to prevent impingement of fish to screen.

2.14 Clearing

The Contractor shall obtain all appropriate permits prior to the clearing or cutting of any trees. Cutting shall be restricted to areas designated by the Owner (see Section 3.6). The Contractor shall obtain a burning permit from the Forestry Division, Dept. of Natural Resources for the burning of timber slash. Burning shall be strictly controlled by the Contractor and carried out with all necessary precautions so as to contain burning and prevent forest fire. Also see Section 2.20 (Forest Fire Prevention).

Burning operations shall only be undertaken on days when the weather conditions are conducive, and in a manner as directed by the Forestry Division. The Resident Engineer shall have authority over burning operations. Burning operations may be suspended at any time by the Resident Engineer or the Forestry Officer.

The Contractor shall comply with the DTW Specification Book, Section 201 Clearing and Grubbing (see Appendix B) with the following exceptions:

(i) Permanent buffer zones of a designated width, (See Section 3.1.2, Buffer Zones, and Appendix B), will be left on each side of the road at watercourse crossings and at adjacent water bodies in proximity to the road. These zones will be delineated in the field by the Owner and flagged with blue ribbon. **Trees and vegetation shall remain undisturbed at these locations up to the edge of the road embankment, or the outlet pool of the crossing, or to the edge of the water body as indicated by the blue ribbon. And in no case shall the Contractor compromise the buffer zone regardless of blue ribbons whether placed or not.**

(ii) Temporary buffer zones shall be marked in the field by the Owner at specified watercourse crossings wherein cutting and clearing shall only be permitted at the time of the installation of the crossing.

(iii) The contractor shall comply with the Migratory Birds Convention Act and Regulations which states that, “no person shall disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird without a permit. Where active nests of migratory birds or birds of prey are present or suspected within the R.O.W., vegetation clearing will not be conducted to the required limits until eggs have hatched and young are mobile (i.e. after August 1). Should any nesting areas be encountered during the clearing operations, the area shall be immediately avoided by the labour force. The EP and Resident Engineer must be immediately notified, upon which time they will provide further direction to the Contractor. The Innu Nation Environment Monitor will also be notified and consulted on this matter.

2.15 Grubbing

Grubbing will be carried out in accordance with the DTW Specification Book Section 203 - Grubbing (See Appendix B) with the following exceptions:

- NS (i) Grubbing limits will be established in the field by the Resident Engineer for portions of the project with regard to adjacent cut and fill zones. *The contractor may be directed to salvage and store live plant material for use along exposed slopes or near stream crossings.* Grubbing operations shall be confined to those portions of the route and scheduled immediately in advance of other road construction operations, the objective being to limit the exposure of large areas of erodible soils for long periods of time. **Grubbing shall not advance more than 2 km beyond fill operations.**
- (ii) Where directed by the Resident Engineer topsoil shall be stripped, stockpiled,

secured, and surrounded by filter fabric to isolate and prevent any runoff from entering an adjacent watercourse. **This grubbing material should not be placed in push lanes but put temporarily along the edge of the ROW for reclamation purposes. This grubbing will be used to stabilize exposed slopes and encourage rapid regeneration of indigenous vegetation.**

- (iii) Filter fabric fencing constructed of a suitable woven geotextile shall be erected at the bottom of cuts and at the lower sections of grubbed areas to prevent the migration of soils, where directed by the Resident Engineer/EP. This fencing will need to be carefully placed as outlined in the specifications book, monitored to ensure proper placement, and removed after the site has been completed.
- (iv) Grubbing shall not be carried out in any stream or tributary to a stream or in any temporary buffer zone or in any location where water is flowing until such time as the crossing or culvert is to be installed. At this time, all flow shall be diverted around the construction area by such means as a plastic lined diversion channel or by pumping so that all grubbing and excavation operations will be carried out **in the dry.**

Where necessary, appropriate erosion or siltation control measures as outline in Section 3.5 and as directed by the Resident Engineer or EP will be installed by the Contractor.

2.16 Bog Excavation

All bog excavation will be carried out in accordance with the DTW Specification Book Section 212 (See Appendix B).

- (a) Excavated muskeg or bog material which will not be incorporated into the right-of-way adjacent to the excavated area will be hauled to a disposal area(s) designated by the Owner and treated as USM referenced in Section 2.8.
- NS (b) The bog excavation will be carried out with an excavator to minimize the disturbance

to the surrounding area. Any silted water generated by bog excavation shall be confined, prevented from entering any watercourse or tributary, and released or pumped to a designated area for ground absorption. The Resident Engineer shall be advised of this operation at least **5 days** prior to work and will provide any necessary direction.

- (c) Bulldozers shall not be used to remove bog or in any work associated with bog removal.

2.17 Borrow Areas

- (a) Borrow materials will come primarily from proposed road cut areas or the widening of these areas within the R.O.W. If additional borrow material is required from a site outside the right-of-way, it shall be a site which is approved by the Mineral Lands Division, Department of Natural Resources.
 - (i) Existing borrow areas shall be used wherever possible.
 - (ii) The owner will designate all borrow areas for subgrade material.
 - (iii) Development of borrow areas will comply with Section 207, (Borrow), and Section 310 (Use of Pits and Quarries), and Division 8 (General Environmental Requirements) of the DTW Specification Book. See Appendix B.
- (b) The operations at new quarry areas used during construction shall also be carried out according to all relevant federal and provincial acts and regulations.
- (c) The development of borrow areas shall be controlled so as to minimize potential environmental damage. The following procedures shall be implemented by the Contractor when using borrow areas:
 - (i) The area to be excavated shall be clear cut of all vegetation prior to the removal of any borrow material;

- NS (ii) All stumps, organic material and topsoil shall be stripped from the area to be excavated, segregated, and stockpiled at least **5m** from undisturbed areas ensuring it is not pushed onto the surrounding trees or vegetation; stockpiled stripping will be kept at least **5m** from the area of excavation;
- NS (iii) Upon completion of excavation, the area disturbed shall be graded to slopes no steeper than 2:1.
- (iv) Following sloping, the grubbing, topsoil and any organic materials shall be re-spread over the disturbed area;
- (v) Borrow areas no longer used shall be rehabilitated to permit rapid revegetation and to prevent erosion and sedimentation. This would be accomplished by reclamation of grubbing material by spreading it out over any exposed soils. If necessary, hydroseeding shall be carried out as directed by the Resident Engineer using an approved seed mixture.
- NS (vi) Borrow areas outside the road right-of-way require prior approval of the Mineral Lands Division, Dept. Of Natural Resources, and shall be located a minimum of **150m** from any watercourse or designated wetland.
- NS (vii) Borrow area rehabilitation must be completed once a site is not used for more than **6 months** or within **1 month** of abandonment. A site in use must have sediment control ponds and erosion protection measures in place if it remains in operation for more than 3 months.
- (d) Information on the location and number of borrow pits will be made available after detailed design and construction planning are completed. Quarry access shall be permanently removed to prevent unauthorized usage unless site is used for maintenance purposes where the access shall be gated.
- (e) Acid Bearing Rock

It is possible during the grading work that sulfide bearing rock may be encountered which is known to produce acid leachate through oxidation after new faces are

exposed. DTW hired a geological consultant to examine areas of potential acid bearing rock prior to construction. No acid bearing rock was found during these surveys. The detailed contract drawings will be used to determine the road right of way in the field. If acid bearing rock is found within the road right of way during construction, consideration will be given to adjusting the road alignment. Where rock excavation is required in such areas the Contractor shall abide by the following:

- (i) Excavating acid generating rock in grade cuts will first be attempted by digging and ripping. If these methods cannot remove the rock then blasting will be used.
- (ii) Where blasting is carried out the amount of over break will be minimized and the blasted rock particle size will be maximized (e.g., through use of nitroglycerin rather than by an emulsion explosive, or using pre-shearing techniques.)
- (iii) Loose dig-able material exposed at subgrade will be removed, where practical, by excavators or small equipment to minimize the volume left in the subgrade.
- (iv) Excavation of the blasted material will be carried out within **three days** of blasting.
- (v) The material will be trucked to a predetermined disposal or interim storage site and placed as directed by the Resident Engineer and EP.
- (vi) Where necessary sampling sites for acid generating rock will be identified and copies of sampling results included in the environmental monitoring reports.
- (vii) Provisions for acid drainage will be identified and addressed in the field by the Resident Engineer and the EP.

NS

2.18 Clean-up

The Contractor shall ensure that the accumulation of waste materials in areas it occupies and access to these areas is prevented. These areas shall be maintained in a neat, clean and safe condition as directed by the Resident Engineer/EP.

On completion of any portion of the work, the Contractor shall promptly remove from the work area all equipment and surplus material to an approved storage area unless otherwise approved by the Resident Engineer.

Before the letter of Final Acceptance is issued the Contractor shall at their own expense and to the satisfaction of the Owner remove all equipment, unused materials and waste materials to ensure the site is left in a neat and clean condition. All borrow sites, USM disposal sites and sediment basins must be rehabilitated to the satisfaction of the Owner.

In the event of Contractor's failure to promptly comply with any of the foregoing, the same may be accomplished by the Owner at the Contractor's expense and the cost of the same may be deducted from any money due or owing to the Contractor whether under this or any other contract.

2.19 Revegetation

Immediately following and during some construction activities, DTW may identify areas which require seeding/sodding or stabilization by a method to prevent erosion as directed by the Resident Engineer/EP for rehabilitation purposes. Seeding and sodding work shall be carried out in accordance with the applicable sections of the DTW Specification Book. Seed mixtures shall consist of native species where possible and as approved by the Owner. Where directed by the Resident Engineer and EP specific areas, such as at some stream

crossings, may require special methods of stabilization involving the removal and relocation of clumps of any natural vegetation mat present or returning grubbing material to the site. At such locations the Contractor will be directed to set aside such clumps of vegetation and/or grubbing material during grubbing operations or at the start of the crossing installation. The owner will inspect all revegetated areas periodically to ensure that adequate results have been achieved. Additional revegetation work will be undertaken if the desired results are not achieved upon direction from the Resident Engineer.

2.20 Burning and Forest Fire Prevention

- NS
- (a) The burning of brush and slash shall only be permitted on this project, with the permission of the Regional Forestry Office and the Resident Engineer. **Such permission may be revoked at any time by the Forestry Officer or the Resident Engineer depending on the prevalence of dry hazardous conditions on site.** The use of rubber tires or waste oil or similar material to ignite slash or to maintain the burning operation shall be strictly prohibited.
 - (b) The Contractor shall take all precautions necessary to prevent fire hazards when working at the job-site and shall keep the job-site free of all flammable waste. Fires shall be located a minimum of **10m** from the existing tree line or adjacent piles of slash, or as directed by a Forestry Officer.
 - (c) The Contractor shall have available, in proper operating condition, sufficient fire fighting equipment, as recommended by the Dept. of Forest Resources & Agrifoods, to suit its location, labour force and construction plant. Such equipment shall comply with the standards of, and have approvals of, Underwriters Laboratories of Canada Limited and shall be maintained in accordance with National Fire Protection Association Codes.

- (d) The Contractor shall ensure that specific employees are assigned to and trained in the use of fire fighting equipment. A list of these personnel should be available on request by the Owner.
- (e) Due to the remoteness of some of the areas in which burning will be conducted the Contractor carrying out the burning operation shall have communication equipment such as a radio or mobile phone on hand which is capable of contacting the site base office immediately in the event of a fire or other emergency. The base office shall be equipped to contact the Forestry Division or other regional emergency personnel.

2.21 Blasting Operations

All blasting activities shall be carried out in accordance with all applicable laws and regulations. Refer to DFO Factsheet #2 and “Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters” (Wright and Hopky, 1998). The Contractor shall submit a detailed blasting plan to the Resident Engineer. The Innu Nation will also be provided with 48 hour notice of any blasting activity.

The Contractor shall advise the Resident Engineer/EP and the Area Habitat Coordinator of the Dept. of Fisheries and Oceans (phone 896-6151) of any anticipated blasting in the vicinity of watercourses or fish habitat and shall submit to DFO all necessary information regarding the work such as locations, methods, and related technical information as may be required for approval prior to commencing drilling and blasting operations. DFO is to be notified a minimum of **5 working days** prior to the Contractor conducting such approved blasting activity. Ammonium nitrate based explosives must not be used in or near water due to the production of toxic by-products.

NS Where local residents are located within **1 km** of a blast site, the Contractor shall limit

drilling and blasting activities to the hours between **8:00 am to 8:00 pm**. All residents located within this area shall be given **48 hours** notice of any blasting activities.

- NS The contractor shall control blasting operations to prevent fly rock from entering any watercourse, water body, or wetland, and from damaging any trees or surrounding vegetation. Any such damaging incidents shall be reported to the Resident Engineer and cleaned-up/rehabilitated within **48 hours**.

SECTION 3 - SPECIAL PROTECTION MEASURES FOR CONSTRUCTION

3.1 Bridge Construction

There are no bridge crossings in this project.

3.2 Watercourse Crossings

The contractor shall be aware that this area of the Eagle River watershed is a migratory route for anadromous fish. The Eagle River sustains a significant run of Atlantic Salmon and

based on previous years information, the main runs of salmon migration occur between June 1 to July 30, the sea trout migration occurs around August 30. **There are a total of seven (7) stream crossings scheduled for this project. A 2000mm culvert is assigned for crossing 165+422. A 2400mm culvert is assigned for crossing 160+940. A 2700mm culvert is assigned for 162+480, and 168+410. A 3000mm culvert is assigned for crossing 158+237 and 183+260. A 5870mmx3710mm structural plate corrugated steel pipe is slated for crossing 128+037. All other smaller culverts are for drainage; however, there is a possibility that these drainage culverts may be classed as actual stream crossings by the Resident Engineer, EP, or DFO Area Habitat Biologist during construction. Due to the fact that drainage channels ultimately flow into streams, it is important that the following procedures are followed for drainage culverts as well as stream crossings. See table 2.**

3.2.1 General Instructions for Watercourse Crossings

The Contractor shall be aware that the work required in and around water crossings shall be performed with due diligence and caution so as to prevent pollution, sedimentation or any damage to the watercourses and downstream areas. All work associated with the installation of culverts or crossing structures throughout the project shall be undertaken to prevent any change(s) to the existing water quality. The Contractor shall carry out all work in and around watercourses in accordance with the environmental provision of the Tender Book and as shown on the contract plans. See Section 2.10. **The Contractor shall immediately notify the Resident Engineer, the EP, and the Department of Fisheries and Oceans (896-6151)**

should any silt or sediment enter streams or any body of water.

The installation of all culverts including stream and drainage culverts shall be carried out in the dry by diverting or pumping water around the construction area. Culverts shall be placed and stabilized within 5 working days of starting installation. Sedimentation basins shall be used to settle out sediment laden water where necessary or where so directed by the Resident Engineer/EP. The sedimentation basins shall be constructed in accordance with the Tender Book, or instructions from the Resident Engineer. All work will be undertaken in accordance with the General Environmental Specifications of the DTW Specification Book, (Appendix B). The Contractor is also referred to the water quality standards set forth in the Environmental Control Water and Sewage Regulations, (Appendix B).

The Contractor shall note that fording watercourses or moving equipment through areas where significant surface drainage is encountered must be carried out in such a manner so as to prevent unnecessary disturbance of the channel bed or embankments or siltation of downstream areas as per the conditions outlined in WRMD's guidelines for fording. This includes, but is not limited to, fording only necessary equipment across and leaving it on the opposite side until alternative measures are implemented such as approved temporary bridges or ramps. Fueling procedures may include the placement of self-dyked JEEP tanks or alternative, safe methods approved by DTW. If there are many crossings anticipated they would have to be approved by DFO. There will be zero tolerance of unnecessary disturbance to the watercourse.

Temporary culverts or temporary bridging are preferred at such locations where frequent fording would be required. For information concerning fording activities, the contractor is referred to conditions as outlined in DFO's "Temporary Fording Sites, Factsheet No. 4" dated 1994.

3.2.2 Buffer Zones

(a) Buffer Zones at Watercourse Crossings

(i) Permanent buffer zones

Permanent buffer zones of undisturbed vegetation will be retained either side of the construction zone at designated watercourses up to the toe of fill. (See Appendix B, Typical Buffer Zones). All work at water crossings including the construction of outlet pools shall be conducted in such a manner as to minimize or eliminate disturbance to remaining vegetation within the permanent buffer zone. On flat grades a minimum buffer zone width of **30 m (each side of the watercourse)** will be used; however, as grades increase the width of the buffer will be increased by using the following rule:

NS **Width of Buffer Zone (m) will be 30m Plus
1.5 Times Slope Gradient (%)**

Or as specific site conditions dictate.

(ii) Temporary Buffer Zones

NS **An ungrubbed temporary buffer zone of 30 m**, on each side of watercourses and wetlands (See Appendix B, Typical Buffer Zones), shall be maintained until such time that the crossing structure is ready for installation. The cutting and removal of trees and slash is not permitted in these buffer zones until such time as the Contractor is ready to install the crossing. Cutting, clearing, and grubbing out (if necessary) of the temporary buffer zones shall take place at the time of the permanent culvert installation, and shall be carried out with due care so as to prevent soils or silt from entering the watercourse. The Contractor is also referred to Section 2.14 (Clearing),

and Section 2.15 (Grubbing).

The following locations have been identified for temporary and permanent buffer zones at stream crossing locations along the route:

TABLE 2
STREAM CROSSINGS REQUIRING BUFFER ZONES

Station	Pipe Size(mm)	Type	Length(m)
158+237	3000	CSP	38
160+940	2400	CSP	24
161+900	5870x3710	Pipe Arch	25
162+480	2700	CSP	20
165+422	2000	CSP	36
168+410	2700	CSP	26
183+260	3000	CSP	TBD

The temporary and permanent buffer zones at these stream crossing locations shall be clearly flagged with blue flagging tape in the field by DTW and the Contractor notified prior to the Contractor's operations proceeding into these areas.

(b) Buffer Zones Between Road & Adjacent Water bodies

A permanent buffer zone of undisturbed vegetation shall be maintained between the highway cutting limits and the edge of adjacent water bodies wherever possible. In areas

NS where the side slope is greater than **30%** the buffer shall be **20m plus (1.5 X slope in %)** or as determined by specific site conditions. Where it is not possible to achieve this buffer, such as when the soil is highly erodible as in sandy conditions, efforts will be made to reduce clearing limits to maximize the buffer.

3.2.3 Scheduling of Work at Watercourse Crossings

Watercourses within the project area sustain various fish populations. In view of the sensitivity of the watercourses noted herein, the scheduling of construction activity at stream crossings will be generally restricted to the least sensitive period, i.e. work associated with watercourse crossings will be permitted from **June 30 to September 1**. Any deviation from this scheduled period for conducting the work will require the Contractor obtaining prior approval in writing from Fisheries and Oceans Canada.

3.2.4 Watercourse Crossings- General Installation Procedures

The Contractor shall adhere to the following general procedures for the installation of all pipes and watercourse crossings:

- NS (a) The Contractor shall obtain a copy of Department of Fisheries and Oceans' Letter of Advice to undertake work in and around the watercourse crossings listed in Table 2 no later than **14 days prior to scheduled construction**.
- NS (b) The Contractor shall present to the Owner for approval, a plan for the construction of cofferdams, diversion systems, and other associated works, no later than **3 days prior to scheduled construction**.

- (c) A pre-construction meeting shall be convened on site between the Contractor and the Owner to review the EPP and the associated contract details pertaining to the structures and culverts to be installed at watercourses.
- NS (d) Give DTW a minimum of **3 working days** notice prior to any in stream or near stream excavation so the Resident Engineer/EP can consult with regulatory authorities as may be necessary.
- (e) Ensure that there is no unnecessary disturbance of stream side vegetation or destabilization of embankments.
- (f) Clearing and excavation limits shall be clearly shown in the field by flagging with blue ribbon for buffer zones and red ribbon for clearing limits.
- (g) Prior to diverting the stream flow into the diversion system, or discharging pumped water, the outlet area shall be stabilized to prevent erosion.
- (h) Prior to any work commencing at the watercourse crossing, the work areas shall be made dry by diverting all water, using cofferdams constructed of sand bags and sheet plastic, or other acceptable method using non-erodible materials, and unwatering the area in addition to other measures which may be necessary. Construct cofferdams with sufficient free board and have sufficient pumping equipment on site to protect the work area and to accommodate peak flows during unwatering operations. Diversion of the watercourse may include such methods as the construction of a plastic lined diversion channel or pumping.
- (i) Ensure that fish are not left stranded out of water in the stream channel work area. Ensure that any fish in the work area are returned to the watercourse unharmed as directed by the Department of Fisheries and Oceans.
- (j) Work should be carried out from the downstream section of the work area and progress to the upstream section.
- (k) Flow diversion methods shall be constructed as approved by the Resident Engineer/EP to accommodate anticipated rain storm events and in such a manner

as to maintain standard water quality objectives.

- (l) Unwatering of the work area for the watercourse crossings shall be carried out as required by the Resident Engineer/EP. Any silted water from the unwatering operation shall be pumped to areas approved by the Resident Engineer/EP, such as vegetated areas for ground absorption, or otherwise to sedimentation basins.
- (m) An impermeable cofferdam of non-erodible material, such as sandbags and sheet plastic, shall be constructed at the outlet area of the construction zone to prevent any silted water from entering downstream areas and to assist in unwatering operations.
- (n) The location, size, construction, and operation of sedimentation basins shall be carried out so as to achieve adequate settling parameters within the basins and ensure that discharged water from the basins, which is entering any watercourse, meets the water quality standards set forth in the Environmental Control Water and Sewage Regulations, (Appendix B, Section 815).
- (o) Operation of the sedimentation basins shall be continuously monitored and cleaned out by the Contractor.
- (p) Any excavated material shall be removed from the site and shall be stockpiled away from the watercourse.
- (q) Excavation shall be carried out to the limits marked (red ribbon) in the field by the Owner. All excavations shall be carried out using a tracked excavator which will operate between the limits of the work area or as directed by the Resident Engineer.
- (r) Outlet pools shall be constructed when required by DFO and/or the owner. These pools shall be excavated and stabilized with hydraulic rip-rap as directed by the Resident Engineer.
- (s) At the inlet area of the pipe, impervious material shall be placed under the invert of the pipe and around the haunches of the pipe so as to ensure that all flow is confined to within the pipe, particularly during low flow conditions, and not lost

into the porous fill zones outside the pipe.

- (t) All sections of newly constructed channel shall be adequately stabilized so as to prevent destabilization, erosion, or scouring of the channel.
- (u) Inlet and outlet head walls and wing walls shall be constructed of stable non-erodible material such as concrete, fitted rock, rip-rap, or armor rock.
- (v) All disturbed areas adjacent the watercourses shall be rehabilitated and stabilized by such means as sodding or seeding, or as directed by the Resident Engineer within **48 hours** of the crossing being installed.
- (w) All construction related waste materials shall be removed from the work site(s). Sedimentation basins shall be pumped dry and backfilled with the original excavated material and compacted. Hand seeding, hydroseeding, and /or sodding of disturbed areas shall be carried out as directed by the Resident Engineer/EP.
- (x) Where possible, drainage culverts should be installed as the road construction work progresses up to these locations. However, in areas where intermittent drainage courses or insignificant flow is present during times of low flow conditions, as often may be encountered at locations where small pipes are to be installed (500 mm to 1200 mm diameter CSP's), and where road construction is progressing, the placement of grading material must not bar off natural surface drainage but permit movement of water through these areas. This can be accomplished with the placement of clean coarse blasted rock until such time as the permanent pipe

NS

installation takes place. **No more than 2 kilometers of road should be constructed at any time before all required permanent pipes are installed.**

- (y) The Contractor is referred to the conditions as outlined in DFO's "Culvert Installations, Factsheet No. 26" dated 1999.
- (z) The Contractor shall comply with the terms and conditions of the permit(s) issued by the Department of Environment and Conservation, Water Resources Management Division.

3.3 Off Right-of-Way Travel

The Contractor will limit equipment travel to the surveyed right-of-way. To obtain approval for additional or new travel routes, the Contractor shall notify the Owner a minimum of **5 working days** in advance of such requirements and not commence work until written approval is given by the Owner. Areas disturbed outside of the right-of-way without the approval of the Owner shall be rehabilitated at the Contractors expense and as directed by the Resident Engineer.

3.4 Sensitive Areas

The right-of-way (ROW) of the road passes through sensitive habitats of many species of fish and wildlife. Waterfowl, raptors, caribou, furbearers, and fish are present throughout the environment of Labrador. Some points of concern are:

- i) Harassment of wildlife by project personnel will be prohibited
- ii) Fuel and other hazardous material spill contingency plans and emergency response measures will be in place and implemented in the case of an accident.
- iii) Construction vehicles will remain in the ROW and all-terrain vehicles will use designated routes.
- iv) Vegetation removal will be restricted to 30 m in the ROW, with removal of forest vegetation in areas where active nests are identified occurring outside of the nesting period in sensitive areas.
- v) Blasting activities will be coordinated to avoid sensitive areas such as

incubation and early brood rearing areas.

- vi) All construction personnel will be required to follow all applicable legislation for hunting and using and storing firearms.
- vii) Instream activity will be reduced or avoided.
- viii) Walls of decommissioned borrow pits will be graded to slopes less than 2:1
- ix) Vehicles will be operated at appropriate speeds and yield to wildlife.

3.4.1 Equipment Operation and Erosion

The potential for erosion as a result of vehicle activity has been identified in all OM (overburden material) cut areas, and USM (unsuitable material) which is to be excavated. Special instructions are provided in section 3.5 of this EPP. Vehicular activity will be minimized and restricted to one track within the right-of-way unless otherwise approved or directed by the Owner. Vehicular activity in these areas shall conform to good construction practices.

Vehicles transported to Labrador for construction work should be steam cleaned prior to transport to reduce the risk of introducing new or invasive species to the area.

3.4.2 Wetlands/Bogs

Bogs are considered sensitive terrain because of their high disturbance potential. They will be marked with **blue flagging tape**. Travel by machinery across bogs shall be strictly prohibited where soft wet bog conditions exist or where frequent travel is required. Bog excavation shall conform to good construction practices and be carried out in accordance with Sections 2.15 and 2.16 and applicable sections of the Specification Book. The Contractor will ensure that bog or wetland areas are not disturbed except for

those sections of the right-of-way designated for excavation.

The contractor shall report all observations of wetland wildlife activity including sightings of beaver and muskrat lodges.

3.4.3 Protection of Rare Plant Species

Phase III of the TLH passes through four eco regions of Labrador including the High Boreal Forest, Mid Boreal Forest, Low Sub Arctic Forest, and String Bog Ecoregion. No species identified by the Species at Risk Act or the NL Labrador Endangered Species Regulation List were identified during the TLH survey. However, plants listed of conservation concern in Labrador by ACCDC were considered when conducting the survey.

The Purple Pitcher Plant is occasionally observed in boggy habitats along the ROW and if observed the Resident Engineer will need to be informed.

3.4.4 Protection of Waterfowl and Raptors

The Canadian Wildlife Service and the Wildlife Division of the Department of Environment and Conservation have requested that DTW cooperate with them in ensuring that any areas adjacent to the road where waterfowl or Raptors (birds of prey such as eagles, ospreys, owls, etc.) may be present or nesting not be disturbed. A ground nesting species of owl known as the short eared owl which is listed as vulnerable by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) may be present in areas along the route. A survey was carried out by Jacques Whitford Environment (Raptor Component Study, September 2003) on behalf of DTW in June 2002 and no raptor nesting sites were found along the route of this project

Further information regarding the identification of such species and required protection measures for any nesting sites will be provided to the Contractor and subcontractors during the Environmental Awareness Session. All of the Contractor's and subcontractor's personnel are required to abide by all protective regulations concerning waterfowl and Raptors.

3.4.5 Land Sensitivity - General Guidelines for Contractors

- (i) Drainage is to be maintained in its natural state wherever possible, with provision being made for spring flooding. Where existing drainage patterns cannot be maintained, alternate drainage will be installed to approximate normal conditions with the approval of the Resident Engineer/EP.
- (ii) No use of machinery of any type is to be permitted outside the clearing limits of the road right-of-way. No equipment shall operate off the cleared ROW or public roads without the permission of the Resident Engineer.
- (iii) No unnecessary cutting of trees is to be conducted.
- (iv) The Contractor shall avoid the practice of using living trees as survey marks and shall not cut blazes or otherwise mark live trees except with removable surveyor's tape and/or tags.
- (v) Where cutting is necessitated, the Contractor shall stockpile and remove all merchantable timber. Other wood waste and slash remaining near the uncut zone may be disposed of by burning. See Section 2.14 (Clearing) and Section 2.20 (Burning and Forest Fire Prevention).
- (vi) The Contractor shall remove all evidence of surveying activity not essential to the continuing maintenance of the corridor following construction. This applies to survey markers and flags which are used prior to construction and subsequent surveying activity which may be necessary during the course of construction.

3.5 Sanitary Facilities

The Contractor shall install and maintain sanitary systems on the work site which are approved by the Department of Government Services (GS). They shall be used by all construction workers. The Contractor shall arrange for the maintenance of these units, the disposal of waste, and final dismantling and removal as approved by GS

3.6 Erosion and Silt Control

The Contractor shall minimize terrain disturbance and erosion resulting from its activities.

The Contractor shall, as part of its work, implement erosion and silt control measures where its activities result in a blockage of natural drainage, the diversion of natural drainage, or the exposure of soil or subsoil to potential erosion. Particular measures may include:

- (i) isolation of disturbed areas through the use of filter fabrics, fencing, or some other equivalent method directed towards prevention and/or control of runoff associated with a disturbed area before it enters a watercourse.
- (ii) using an appropriate hydraulic mulch;
- (iii) spreading hay over exposed soils;
- (iv) spreading a thin layer of brush, grubbing material, or slash over disturbed areas;
- (v) the installation of baffles or sediment traps at appropriate intervals within the area of disturbance;
- (vi) the installation of drainage collectors across the disturbed area to channel drainage into vegetated areas;
- (vii) the re-routing of disturbed drainage courses back into the natural course;
- (viii) the stabilization of exposed soils at drainage locations with appropriate rip-rap;
- NS (ix) where so directed by the Resident Engineer/EP, hay or straw bales shall be used to construct check dams to confine mud or slurry at such locations as unsodded ditch

lines, catch-basins and culvert inlets. The bales shall be dug into the earth approximately **10cm** and shall be anchored in place by means of wooden stakes or other acceptable means. Where bales are placed perpendicular to a ditch line flow, they shall extend far enough up either side so the bottoms of the end bales are higher than the top of the lowest center bale. The Contractor shall clean sediment out from around the check dams as required or at the discretion of the Resident Engineer/EP. The bales and stakes shall be removed and disposed of, off the site, once the permanent cover is established.

- (x) The pumping of silted water to settling or designated vegetated areas;
- (xi) The installation of mud basins of adequate size at run-off locations from exposed areas to contain heavy silt and mud as directed by the Resident Engineer/EP.
- (xii) All mitigation measures shall be inspected on a daily basis and repaired as needed to ensure that they function properly.
- (xiii) The use of extended weather forecasts to ensure that environmental protection measures are designed to withstand storm events.

3.7 Clearing and Timber Salvage

- (a) The clearing width will vary according to the extent of cuts and fills. Safety considerations will be balanced with the conservation of trees in determining the actual clearing limits. Limits will be marked with red ribbon and all cutting shall be restricted to areas within these limits.
- NS (b) Clearing for the corridor shall consist of the cutting of only those trees or areas delineated in the field by the Owner. All “merchantable timber” as defined by the Forestry Division (9 cm (3.5 inches) outside bark diameter at breast height) shall be salvaged and removed from the site. Timber that is temporarily stored within the Right of Way shall be stockpiled outside the fill limits. All portions of the tree must be harvested up to a 5 cm (2.5 inch) top diameter with stump height not

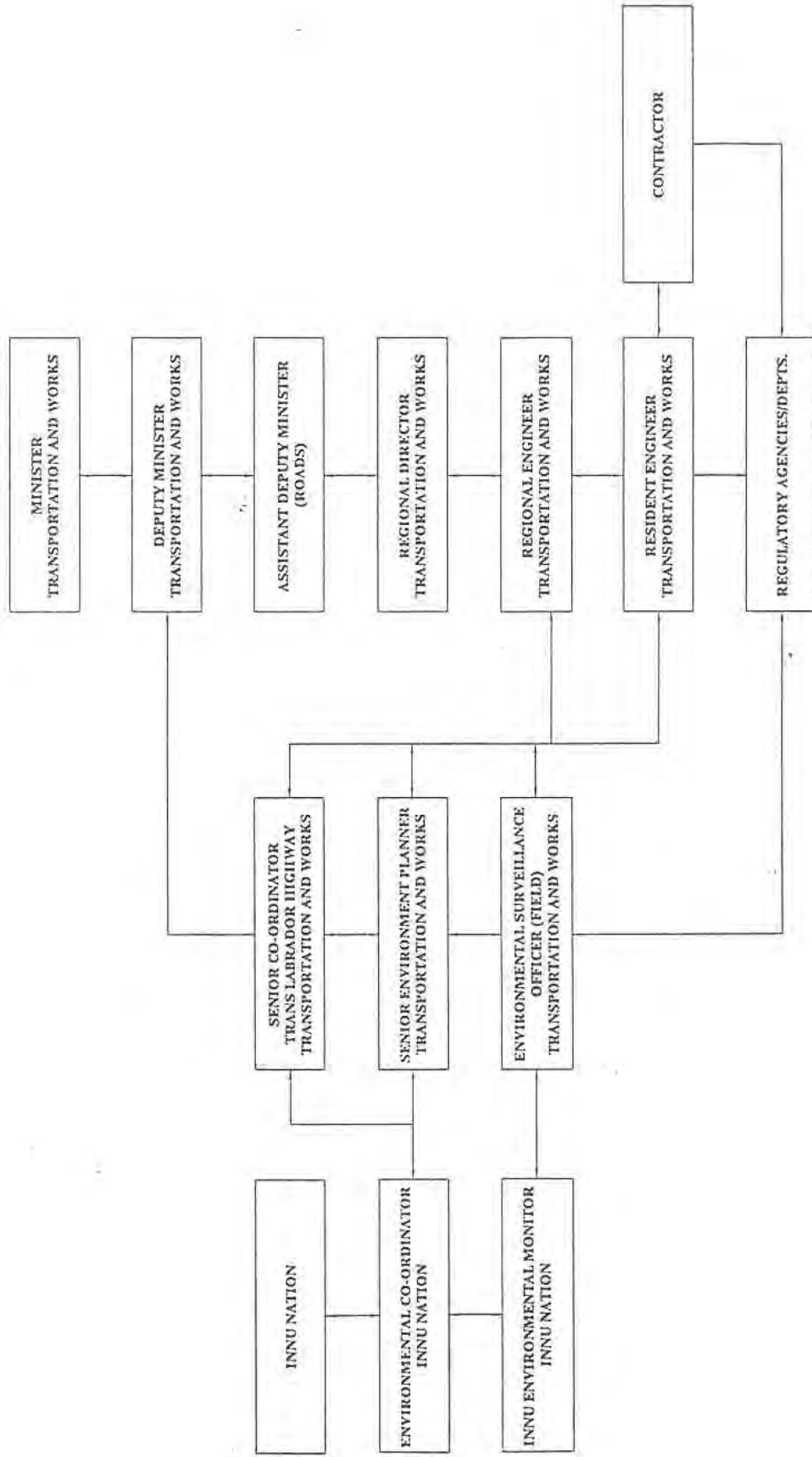
exceeding 16 cm (6 inches). Merchantable timber shall be the property of the Contractor.

- NS (c) All material shall be cut to within **150mm** of the surface of the ground. All trees and brush shall be cut into lengths to ensure neat piling can be accomplished.
- NS (d) Slash shall be mechanically mulched so that it will not create a fire hazard or become unsightly.
- (e) Slash and other construction material or debris shall not be permitted within 30 m of any water body, to enter any watercourse, water body or wetland and shall be piled such that seasonal flood waters cannot reach them.
- NS (f) At designated watercourses, the cleared right-of-way shall be reduced to a length to be determined in the field by the Owner. Restrictions on activity within these buffer zones are detailed in Special Protection Measures Section 3.1.
- (g) Trees outside the indicated clearing widths which in the opinion of the Owner would constitute a hazard to the safety of the proposed highway and which are so designated and flagged (red and blue ribbon) by the Owner, shall be removed.

Appendix A:

Environmental Management and Reporting Flow Chart

FIGURE 1
TRANS LABRADOR HIGHWAY
ENVIRONMENTAL MANAGEMENT AND REPORTING



LEGEND
 — DIRECT FORMAL COMMUNICATION

Appendix B:

General Environmental Specifications

**DIVISION 8****GENERAL ENVIRONMENTAL REQUIREMENTS****INDEX**

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 801

OWNER'S POLICY

OWNER'S POLICY

To ensure protection of the environment, the work at all times shall be subject to inspection by the staff of relevant municipal, provincial and federal agencies. Normally, all inspections other than by the Engineer will be arranged in advance through the Engineer. Any specific matters relating to environmental protection will be dealt with between the Contractor and the Engineer.

Any violations of environmental permits or authorizations or any environmental related incidents which are observed by inspectors representing regulatory agencies are to be reported by them prior to leaving the site to the Engineer. Except in emergency situations, environmental protection measures required by other agencies must be approved by the Engineer prior to implementation by the Contractor.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 805

CONTRACTOR'S RESPONSIBILITIES - REGULATORY AGENCIES

The Contractor shall ensure that its employees, Sub-contractors and their employees, machinery and equipment operators, and truckers comply with the conditions of the contract and with all applicable environmental laws, regulations, permits, and requirements of federal, provincial and municipal authorities, and such other rules and regulations as the Owner may establish.

Contractors, Subcontractors and their personnel shall not harass wildlife or waterfowl or unduly disturb fish. Any contravention of environmental requirements, including employee actions accidental or otherwise, resulting in environmental damage shall be reported to the Engineer without delay.

The Contractor may be required to obtain all or some of the following permits where such are required:

MAJOR REGULATORY APPROVALS BY TYPE AND AGENCY

<u>TYPE OF PERMIT</u>	<u>AGENCY</u>
1. Stream Crossing Authorizations	Fisheries and Oceans Canada Water Resources Division Department of Environment
2. Wood Cutting/Clearing	Forestry Division, Department of Natural Resources
3. Burning Permit	Forestry Division, Department of Natural Resources
4. Fuel Storage/ Handling	Government Services Center, Department of Government Services
5. Water Supply/ Sewage Disposal	Government Services Center, Department of Government Services
6. Asphalt Plants	Government Services Center, Department of Government Services
7. Solid Waste Disposal	Local Municipal Authority
8. Quarry or Pit Operations	Mineral Lands Division, Department of Natural Resources
9. Structures at Navigable Waters	Canadian Coast Guard, Transport Canada
10. Herbicide Application	Pesticide Control Branch Department of Environment
11. Stream Crossings(designed by the Contractor)	Water Resources Division Department Of Environment and Conservation

The Contractor shall obtain all other permits and approvals which may be necessary to comply with government laws and regulations. Prior to the commencement of specific work elements, the Contractor shall immediately provide the Engineer with two copies of all permits.

Contractor's failure to comply with the regulations of any authority having jurisdiction over the works, or part thereof, or any aspect of the performance of the work and the manner of carrying out the work, will entitle and result in the Owner appointing such engineer, engineers, compliance officer or officers as may be necessary to more fully cause compliance by the Contractor with the requirements of the relevant regulatory authority.

The Owner may thereafter, and for so long as the Owner may keep such engineer, engineers, compliance officer or officers, on the site of the works, deduct from the progress payments otherwise due to the Contractor the costs including but not limited to payroll, payroll burdens, accommodations, meals, and transportation costs associated with the work of such engineer, engineers, compliance officer or officers as the case may be. The Contractor shall have no right to dispute the Owner's right to appoint such engineer, engineers, compliance officer or officers,

FORM 805

the reasonableness of the deduction of such costs or the amount thereof and the Engineer's certificate of the amount of such costs shall be final and binding upon the Contractor and the Owner.

SECTION 810

USE OF HERBICIDES FOR BRUSH CONTROL OPERATIONS

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810.01 SCOPE

This specification covers the supply and application of herbicide to broadleaf brush and trees.

Specific locations to be sprayed, and areas to be omitted, shall be designated by the Engineer.

810.01.01 General

The Contractor and Subcontractor(s) are required to comply with environmental protection measures contained in this section and all applicable environmental protection regulations of Federal, Provincial, and Municipal Authorities.

No pesticides or other products shall be used without prior approval of the owner and the Department of Environment & Conservation. Each pesticide to be used, its application rate, and area of use, shall be subject to regulations under the Environmental Protection Act, 2002 and the Pesticide Control Regulations, 2003. A copy of the Material Safety Data Sheet (MSDS) and Pesticide Label Information shall be supplied to the Resident Engineer 5 days prior to any use by the Contractor. Two copies of any approval issued to the Contractor for chemical usage under these Regulations shall be provided to the Engineer. As part of the Contractors Hazard Assessment prior to the start of contract work an emergency/contingency plan shall be developed in case of a spill and provide a copy of this plan to the Resident Engineer.

810.02 MATERIALS

The herbicide to be used to execute the work of this contract shall be, as specified in the contract documents, and shall be approved on the Pesticide Operator Licence issued to the pesticide operator by the Department of Environment & Conservation.

All herbicide brought onto site for the execution of the contract shall be contained in sealed containers and will be inspected by the owner to ensure that such herbicides are properly registered under the Pesticides Control Act RSN 1990, and approved by the Newfoundland Department of Environment, and are of the type, strength and quality specified therein. Any herbicide not meeting these requirements shall be rejected.

"BLAZON" dye shall be used as colouring agent at the manufacturer's recommended concentration.

810.03 HERBICIDE STORAGE & HANDLING PROCEDURES

Contractor shall ensure that herbicides are handled only by personnel who are licenced, trained and qualified in handling these materials in accordance with manufacturers' instructions and government regulations(**Section 13 of the Pesticides Control Regulations**). The Contractor will be required to verify personnel qualifications as they pertain to this item and provide written confirmation of same to the Engineer. The Contractor shall supply a copy of the product safety data sheet to the Engineer of all herbicides or hazardous substances which will be used during the course of the contract. Tank refilling operations shall be supervised at all times. Under no circumstances shall any tank refilling procedure be left unattended by the operator.

Handling and tank filling/transferring procedures shall be carried out to prevent the contamination of soil or water. Tank filling or servicing of mobile equipment shall not be allowed within **100 m** of a watercourse, water body, or designated wetlands. Herbicides and other chemicals shall be stored at least **100m** (horizontal distance) from any water course, water body, or designated wetland unless otherwise approved by the Engineer and/or the Department of Environment and Conservation.

Any pesticide storage sites must meet the requirements of Section 13 of the Pesticides Control Regulations, 2003 as follows:

- A source of water must be kept in an area in or adjacent to the storage area;
- Approved safety equipment as required which is properly maintained, functional and available at all times for personnel handling and working with pesticides;
- Flooring in a storage area shall not contain a floor drain or catch basin which is directly or indirectly connected to a private or municipal sewage system or public water course;
- Flooring shall be capable of being cleaned and decontaminated of pesticides stored within;
- Adequate ventilation by either natural or mechanical means so as to prevent the accumulation of toxic and/or flammable vapours;
- A "Danger Stored Pesticide" sign posted on all entrances which is printed in block letters 5 centimeters or more in height;
- Cleanup procedures, materials, and equipment available to cleanup spills or leakage;
- Security procedures consistent with the instructions of the Minister or persons designated by the Minister

In addition to these storage requirements each pesticide storage site shall have prominently displayed on all entrances contact telephone numbers for the operator and the Department of Environment & Conservation, Pesticides Control Section, and indicated accordingly.

All entrances to the storage sites must be locked when the owner or an employee of the owner is not present.

Pesticides shall be stored in their original container or a substitute container approved by the manufacturer. Substitute containers shall be labelled appropriately with labels provided by the manufacturer.

Concentrated pesticides transported in a vehicle during spray operations shall be contained in a locked box, secure area or compartment which must be locked while unattended. Pesticides shall not be transported in the passenger compartment of any vehicle.

810.04 EQUIPMENT

Prior to acceptance of the tender, the Contractor shall provide proof that the spray equipment, auxiliary mixing and storage equipment, and associated equipment that is intended to be used meets the requirements of the manufacturer of the herbicide. Equipment shall be in good working condition with tanks secured properly, have hoses of good integrity (not cracked) and all pumps seals and joins tight with no leaks.

All equipment applying liquid herbicide solution shall be capable of ensuring that all active ingredients are contained in the target area.

The Contractor shall provide all material, construction plant and personnel necessary for the continued operation of application equipment. All vehicles used in the application of pesticides shall have a copy of the contingency plan located within the vehicle.

810.05 GENERAL APPLICATION REQUIREMENTS

Herbicides shall be applied by low volume broadcast spray ground application in all areas to be treated utilizing a spray delivery system (such as the Radiarc sprayer or approved equivalent) which offers effective drift control. Aerial spraying from planes and helicopters will not be permitted. The spray system utilized must be acceptable to both the herbicide manufacturer the Resident Engineer assigned to monitoring the herbicide application and Pesticides Control Section of the Department of Environment & Conservation.

The Contractor is required to obtain a Pesticide Operator's License from the Pesticide Control Section, Department of Environment.

Prior to the commencement of specific work elements, the Contractor shall immediately provide the Engineer with two copies of all permits.

Any contravention of environmental requirements, including employee actions accidental or otherwise, resulting in environmental damage shall be reported to the Engineer without delay.

Contractor shall be responsible for clean-up, reclamation and/or restorative measures as may be directed by the Engineer, or by provincial or federal agencies through the Engineer.

810.05.01 Spray Conditions and Restrictions

The Contractor shall provide proof satisfactory to the Engineer that the strength of spray solution and the method of application meets the requirements of the manufacturer supplying the herbicide as specified on the product label. A supervisor from the Department will be appointed to monitor the Contractor at all times when he is working with the herbicide and shall be supervised by Department personnel trained in the application of pesticides.

Contractors are advised that, notwithstanding the stipulations included with the Contractor's Pesticide Operators License issued by the Pesticide Control Section of the Department of Environment, the Contractor will ensure that:

- (a) The herbicide shall be applied only to the highway right-of-way which has been previously cut, and subsequently designated for treatment.
- (b) The Contractor shall be aware that some watercourses may be in close proximity to the designated spray area. Due care and caution shall be taken to ensure that herbicide spraying operations do not impact on any watercourses or water bodies and meet approved buffer zone requirements of the Department of Environment and Conservation and the manufacturer.

- (c) Ground based spraying is permitted only when: wind speeds are between 2 and 15km/h, air temperatures are below 25°C, the relative humidity is above 50%, it is not raining, and rain is not anticipated over the next two hour period.
- (d) The Engineer in consultation with the Contractor and officials of the nearest weather office shall determine daily the suitability of weather conditions to undertake the application of herbicide. The Engineer has the authority to stop the spraying of herbicide at any time based on local conditions and weather measurements. The site supervisor for the Department of Transportation & Works shall be given access to an anemometer on site to determine the wind speed, temperature and humidity at the site.
- (e) There shall be no herbicide application within densely populated areas. Spray areas within commercial or residential developments, house or cottage areas are to be determined in the field by the Engineer. A **50 m** buffer shall be maintained.
- (f) Areas designated by the Engineer, in consultation with the Department of Environment, as areas to be omitted from spraying, shall not be sprayed.
- (g) The Contractor shall take due care and caution when applying herbicide in close proximity to land used for agricultural purposes. Drifting of spray onto land utilized for agricultural purposes shall not be permitted.
- (n) Equipment is not permitted to operate in any watercourse or ditch containing or which may contain water which enters a watercourse.

810.05.02 Daily Logs and Written Report

Contractors are advised that reports and records are required by the provincial Department of Environment. Their use is of the utmost importance to any right-of-way management program and they shall form an important part of this contract. The Contractor shall ensure that all logs, records and reports are completed fully, are legible, and are signed by authorized personnel.

The submission of appropriate documentation as may be required shall be a requirement to the satisfactory completion of this contract.

810.05.03 Safety

The Contractor shall be responsible for the proper handling and safe use of all herbicides.

The Contractor shall be responsible for the safety of its employees in the application of herbicides and for the supply and use of all recognized safety equipment.

The Contractor shall have with each crew, a minimum of one person who is qualified in First Aid. This person(s) shall also be in possession of a valid Standard First Aid Certificate.

In addition to standard First Aid Kits, Contractor shall, at its own expense, have on site with each of its crews adequate first aid supplies that are unique to accidental herbicide exposure.

The Contractor shall rinse empty herbicide containers three times and use the rinse in the spray mixture. If the rinsed containers are not to be returned for refilling with herbicide then the rinsed containers shall be punctured several times to ensure they will not be used for filling with other substances and then disposed of in a manner approved by the Department of Environment.

The Contractor shall ensure the safety of all individuals including pedestrians, residents, vehicular passengers and operators or others as may be encountered during spray operations.

810.05.04 Clean Up

Upon completion of herbicide application, the Contractor shall remove all of their rubbish, debris, surplus materials and equipment from the site.

The Contractor shall place rubbish and refuse in proper containers and shall dispose of same at an approved waste disposal site with permission of the waste disposal site owner/operator.

The Contractor shall not wash equipment or containers, nor dump herbicides in or near any fresh or salt water bodies, or at any location where the herbicide may enter a body of water.

810.05.05 Spills

- (a) The Contractor shall maintain on site with each crew engaged in the mixing and application of the herbicide mixture, an approved supply of absorbent materials as part of the overall spill cleanup kit.

Absorbent materials shall consist of activated charcoal, sawdust, peat moss or other materials in quantities as may be required by appropriate authority and the Engineer.

In the occurrence of spillage or leakage, the Contractor shall undertake prompt action to minimize the extent of damage through the application of absorbent materials or other procedures as may be required.

Any soils or other materials contaminated as a result of spillage, leakage or inappropriate actions taken by applicators shall be removed and the affected areas subsequently rehabilitated at the Contractor's expense.

Disposal of contaminated soils and other materials shall be the responsibility of the Contractor subject to approval by the appropriate authority, the Engineer and the Pesticide Control Section.

- (b) All spills involving greater than 10 litres of mixed formulation or the equivalent of unmixed formulation shall be reported immediately to the Pesticides Control Section as described below. All spills involving mixed or unmixed pesticide in or within 500m of water bodies, wells or areas frequented by people, shall be reported immediately to the Pesticides Control Section, St. John's (Ph: 729-3395) and Environment Canada (EPS) St. John's (Ph: 772-2083).

The Contractor shall submit a corresponding written report within two (2) days of occurrence to the project supervisor who will in turn forward the report to the Director of Design and Construction. The report shall identify cause, actions taken to clean up area, actions taken to prevent a recurrence, actions taken to dispose of contaminated material and any environmental damage.

810.05.06 Newspaper Notice

The Contractor shall advise the public of the purpose and scope of the project by means of newspaper notices. The Contractor shall place the notices in at least one newspaper with circulation in the municipalities whose boundaries encompass treatment areas. The newspaper ad will appear in any issue at least one week prior to commencing the program. The ad will state the area that is proposed for treatment over the next 21 calendar days at the end of which another ad is to be placed until the program is completed. The ad will contain a phone number at which the Contractor may be contacted for information regarding the spraying operation and the Department of Environment Pesticides Control Section 729-3395.

810.05.07 Signs

The Contractor shall provide and erect signs indicating that the right-of-way has been treated with herbicide. These signs shall be posted at the time of treatment and indicate the type of herbicide(name of formulation) used, PCP Act Registration Number, Date of Application, Company Name carrying out the application of herbicide and phone number for additional information, Department of Environment and Conservation phone number 1-800-563-6181 and the locations treated as stipulated in the Pesticide Operator's Licence Terms and Conditions issued by the Department of Environment and Conservation.

810.05.08 Notices to Adjacent Property Owners

The Contractor shall make every reasonable attempt to verbally notify adjacent property owners, prior to the spray program. In the event this cannot be done, the Contractor shall use written notification to all

dwelling to the satisfaction of the Resident Engineer and the Pesticides Control Section of the Department of Environment & Conservation.

810.05.09 Guarantee

The Contractor shall achieve a 95% brush kill in the target area. If spot checks, after the herbicide treatment is completed, reveals that the 95% brush kill was not achieved, then the Contractor will be required, at his own expense, to retreat these areas to obtain the 95% brush kill in the target area.

810.06 MEASUREMENT FOR PAYMENT

Measurement will be made of the horizontal area actually sprayed with herbicide within the area indicated to be sprayed or as staked out by the Engineer. These measurements shall be computed to obtain the area in hectares, measured to three decimal places.

Spraying of areas beyond the limits as designated by Engineer will not be measured for payment.

810.07 BASIS OF PAYMENT

Payment at the contract price for supply and application of herbicide shall be compensation in full for all labour, materials and equipment use to carry out the work indicated in these specifications, and shall include all costs involved in: placing newspaper notices, providing signs, and obtaining and conforming to the conditions of required permits, together with the removal of any debris (containers, absorbent, etc.) including obtaining an approved waste disposal area and hauling away and disposing of the debris in the waste disposal area, if required.

SECTION 815 PROTECTION OF WATERCOURSES AND WATER BODIES

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815.02	LEGISLATIVE REQUIREMENTS
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815.07	CONTROL AND TREATMENT OF SILTED WATER
815.08	FILL PLACEMENT AT WATER BODIES

815.01 SCOPE

This specification covers the environmental requirements for work being carried out at watercourses and water bodies. It includes references to Federal and Provincial Legislation and prescribed methods and procedures to employ when carrying out such work as culvert or bridge installations, stream diversions, fording, fill placement at water bodies, and any other work which may alter or impact any watercourse or water body, or the quality of the water therein.

815.02 LEGISLATIVE REQUIREMENTS

The Contractor shall be aware of all Federal and Provincial Legislation governing the protection of watercourses and water bodies and all revisions and amendments to this legislation.

815.02.01 PROTECTION OF INLAND FISHERIES ENVIRONMENT

All permanent or temporary works or undertakings which are proposed for watercourses or water bodies constituting fish habitat require authorization from the Fish Habitat Management Branch of the Department of Fisheries and Oceans Canada at least two weeks prior to the commencement of any work. The Contractor is required to obtain approval for all temporary stream crossings and provide the Engineer with two copies prior to any work.

Application forms for authorization for works or undertakings affecting fish habitat are available at Department of Fisheries and Oceans Canada offices located at St. John's, Grand Bank, Grand Falls, Goose Bay, and Corner Brook.

Contractors are referred to the Department of Fisheries and Oceans Canada publication entitled "Resource Road Construction - Environmental Guidelines and Design Criteria", latest edition, (and to other technical information). The DFO "Fact sheets" contain recommended guidelines for culvert installations, road and bridge construction, and other works. They include mitigative measures and procedures intended to assist Contractors in minimizing impacts on fish and fish habitat.

Contractors are advised that Environmental and Fisheries regulations require that any work done in or near a watercourse, deemed to be viable fish habitat, must be restricted to the minimum of disturbance. The establishment of temporary and permanent buffer zones are required. (Reference, Standard Drawing No.1237). Great care must be taken during construction not to harmfully alter, disrupt, or destroy fish habitat or to deposit any substance which may be harmful to fish habitat in or near any watercourse where it may enter the watercourse. Culvert pipes must be constructed, according to the requirements of the applicable permits, to allow free movement of fish.

Contractors are advised to refer to the Fisheries Act with particular attention to:

- Section 35 - Outlines required authorization for work or undertaking which may affect fish habitat.
- Section 36 - Prohibits the deposit of a harmful substance of any type into water frequented by fish.
- Section 37 - Powers of the Minister for the provision of information such as plans, specifications, studies, etc., and to require any modifications to such plans and/or related information.
- Section 38 - Powers of a Ministerial Inspection.
- Sections 40-42 - Enforcement and Penalties.

815.02.02 THE ENVIRONMENTAL CONTROL (WATER AND SEWAGE) REGULATIONS

Contractors shall maintain compliance with the Environmental Control (Water and Sewage) Regulations, 2003 or latest edition. This legislation is administered by the Water Resources Division of the NL Department of Environment.

No person shall discharge into a body of water any sewage or effluent.

815.02.03 THE WATER RESOURCES ACT DEPARTMENT OF ENVIRONMENT

Where the Contractor must carry out any alteration of a body of water **which is not required specifically as part of the contractual work with the Department of Transportation and Works**, the Contractor must obtain a Permit from the Department of Environment and Conservation before carrying out the work. Alterations to watercourses and water bodies such as culvert installations, bridges, stream diversions, rock fill placement in water bodies, etc., which are typically required as part of the contractual work are authorized and administered by DT&W and do not require separate approval from the Department of Environment and Conservation. All such alterations to bodies of water must be carried out according to established procedures of the regulatory agencies so as to prevent pollution or damage to the environment.

The Contractor is referred to the following **Environmental Guidelines** of the NL Department of Environment and Conservation, Water Resources Division, regarding construction procedures at watercourses:

Chapter	Title	Chapter	Title
3	WATERCOURSE CROSSINGS	7	DIVERSIONS, NEW CHANNELS, AND MAJOR ALTERATIONS
4	BRIDGES	9	PIPE CROSSINGS
5	CULVERTS	13	GENERAL CONSTRUCTION PRACTICES
6	FORDING		

815.03 FORDING OF WATERCOURSES

The use of equipment or machinery in a watercourse or water body is generally not permitted. Should it be necessary for equipment to ford a watercourse, then the approval of the Resident Engineer is required for the specified equipment only and at a designated location. The same crossing point shall be used each time that a fording is required. When extensive or frequent crossing of a watercourse is necessary, a temporary culvert or bridge installation may be required instead of fording. The Contractor is referred to the NL Environmental Guidelines Chapter 6, "Fording" of the Dept. of Environment and Conservation, regarding the selection, site preparation, and use of fording sites. The Contractor shall discuss all proposed fording sites with DT&W a minimum of 5 working days before any fording activity. Site selection require the written approval of the Engineer.

815.04 CLEARING AND/OR GRUBBING ADJACENT TO WATERCOURSES

The Engineer shall mark limits for clearing and grubbing adjacent to watercourses. Buffer zones of undisturbed vegetation shall be maintained at watercourse crossings as marked in the field. (Reference, Standard Drawing No.1237, Typical Temporary and Permanent Buffer Zones At Stream Crossings.) A permanent buffer zone shall be maintained both sides of the construction zone at watercourse crossings, wherein, no disturbance or cutting of vegetation is to take place. A temporary ungrubbed buffer zone shall be maintained on both sides of the watercourse, unless otherwise directed by the Engineer, within the construction zone at watercourse crossings until such time as the installation of the crossing is to be carried out. The Contractor shall use appropriate mitigative measures such as the use of silt fencing, sedimentation basins and take-off ditches to control sediment laden runoff from entering watercourses.

815.05 GENERAL PROCEDURES FOR INSTALLING WATERCOURSE CROSSINGS

The Contractor shall present to the Engineer for approval, a plan for the construction of unwatering systems including diversion systems, pumping systems, settling and/or filtration systems, a minimum of **3 working days** prior to the start of any work at the site.

A pre-construction meeting shall be convened on-site between the Contractor and the Engineer to review environmental protection measures and associated contract details pertaining to the watercourse crossing, prior to any work being carried out at the proposed crossing site.

All work carried out at watercourses shall be performed in the dry and with due care and caution so as to prevent unnecessary disturbance or impact on adjacent land or downstream areas. Where watercourses are deemed fish habitat, work within the channel is generally prohibited between September 15 and June 1, on the island portion of the province, and between September 1 and June 30 for Labrador, unless otherwise approved by DFO and the Resident Engineer. The Contractor shall carry out all work in and around watercourses in accordance with all Federal and Provincial permits and requirements, the relevant sections of the DT&W Specifications Book, and the contract drawings.

The Contractor shall give **3 working days** notice prior to any in stream or near stream grubbing or excavation.

Buffer zones shall be established and maintained as described in section 815.04.

An approved cofferdam shall be installed at the low end of the construction zone to collect all site water which is to be disposed of in an approved manner. (See Section 815.07 Treatment of Silted Water).

The operation of heavy equipment shall be confined to dry stable areas in order to prevent the generation of mud and silted water. All flow shall be diverted or pumped around or through the work area, by a means acceptable to the Engineer, so as to maintain flow in the watercourse immediately below the site, prevent erosion, and maintain acceptable water quality. The flow diversion system shall have sufficient freeboard to be capable of accommodating rain events or provision shall be made to safely discharge elevated flows without causing washouts of constructed works, erosion, or siltation in downstream areas. The discharge location of the pumping or diversion system shall be stabilized to prevent erosion. All unwatering operations shall be constantly monitored by the Contractor.

Work should be carried out from the downstream section of the work area and progress to the upstream .

The Contractor shall ensure that fish are not left stranded in the work area at the time the diversion system is made operational. All stranded fish shall be removed by appropriate means and quickly returned to the watercourse below the construction area to prevent mortalities. An impermeable cofferdam of non-erodible material, such as sandbags and sheet plastic, shall be constructed at the outlet area of the construction zone to prevent any silted water from entering downstream areas and to assist in unwatering operations.

The location, size, construction, and operation of sedimentation basins shall be carried out according to Department specifications or as directed by the Engineer and so as to achieve adequate settling parameters within the basins and ensure that discharged water from the basins, which is entering any watercourse, meets the water quality standards set forth in the Environmental Control (Water and Sewage) Regulations, (See Section 815.02.02).

Operation of the sedimentation basins shall be continuously monitored by the Contractor to ensure proper functioning and maintenance.

Excavation shall be carried out to the limits marked in the field by the Engineer. All excavations shall be carried out using a tracked excavator which will operate within the limits of the work area or as directed by the Engineer.

Excavated material shall be removed from the site and stockpiled at an approved location where it will not enter any watercourse.

When corrugated steel pipes are installed, impervious material shall be placed under the invert of the pipe and around the haunches of the pipe at the inlet area so as to ensure that all flow is confined within the pipe, particularly during low flow conditions, and not lost into the porous fill zones outside the pipe.

All sections of newly constructed channel and pipe inlet and outlet areas shall be adequately stabilized so as to prevent destabilization, erosion, or scouring of the channel and fill embankments. Rip-rap on road slopes shall be placed concurrently with backfilling operations on the pipe so that inlet and outlet areas are protected immediately from erosion.

Any disturbed areas or exposed soils within the high water zone of the watercourse shall be stabilized by such means as placing rip-rap or well staked sodding within 48 hours of completion of backfilling operations. Other adjacent disturbed areas shall be rehabilitated by sodding or seeding, or as directed by the Resident Engineer.

Upon completion of the work, flow shall be introduced slowly into the new channel or watercourse crossing. Any silted water generated as a result shall be prevented from entering downstream areas of the watercourse, and pumped or treated as required.

Where baffles are required as part of a culvert installation all activities associated with the baffle pipe installation including the diversion of all water flow from the natural watercourse into the baffled pipe, abandonment of any temporary stream diversion system and rehabilitation of the surrounding disturbed area shall be carried out efficiently without delay so as to not interfere with fish migration.

All construction related waste materials shall be removed from the work site(s).

Sedimentation basins shall be pumped dry and backfilled with the original excavated material and compacted. Hand seeding, hydroseeding, and /or sodding of disturbed areas shall be carried out as directed by the Resident Engineer. Additional rehabilitation may be required by the Engineer.

815.06 USE OF FRESH CONCRETE IN OR NEAR BODIES OF WATER

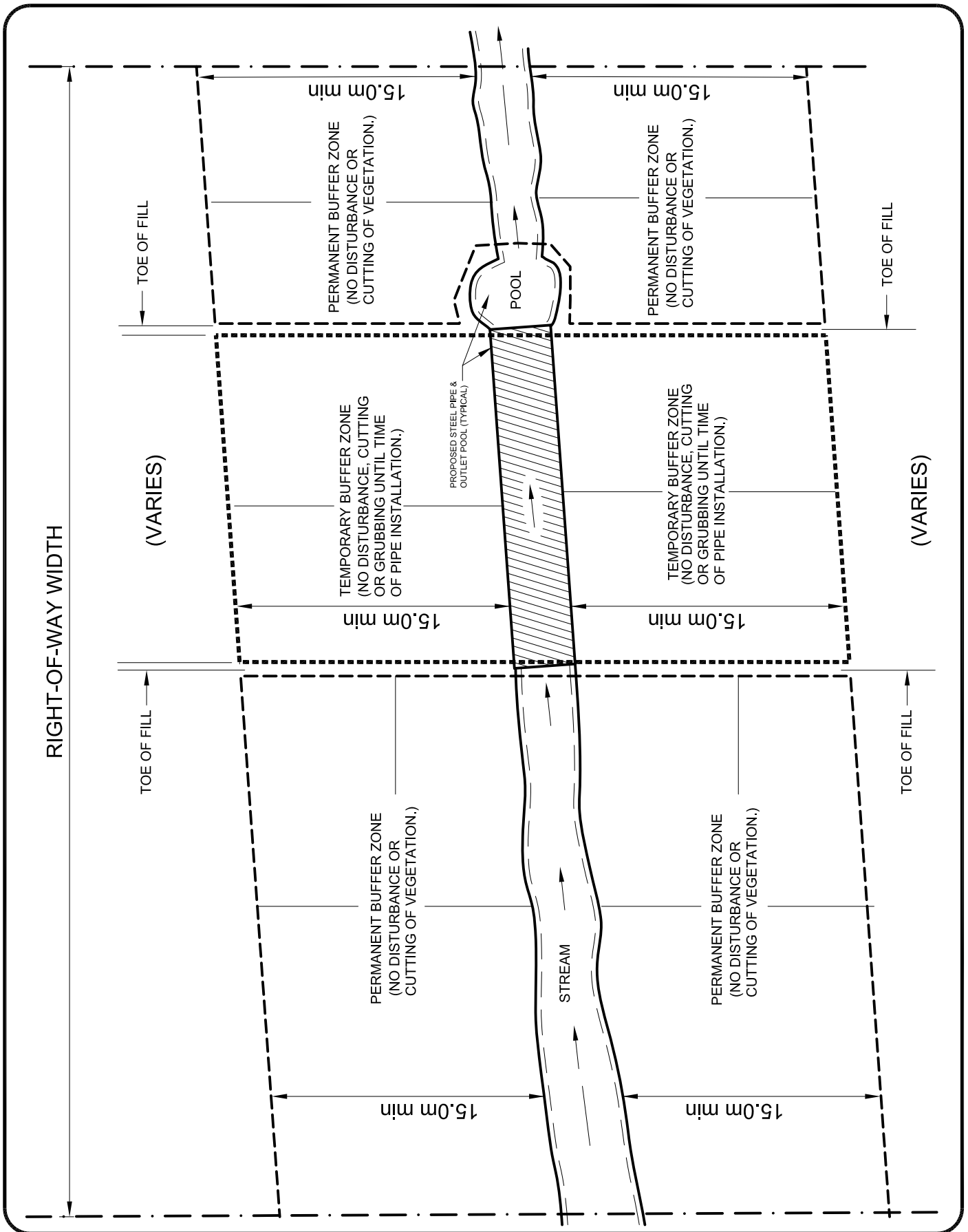
When concrete is placed in or adjacent to a watercourse or water body, all necessary precautions shall be taken to prevent the concrete from adversely affecting water quality. Whenever possible, fresh concrete shall not come in contact directly with the waters of a watercourse. Standing water zones shall be drawn down prior to placing fresh concrete. All form work shall be well secured and made tight to prevent leakage of fresh concrete into any adjacent waters. Where tremmie concrete is required, the work shall be carried out under the specific directions of the Engineer. The washing of concrete delivery trucks or chutes is not permitted within 100 m of any watercourse or water body. All necessary precautions shall be taken when handling related substances such as form coatings and concrete admixtures to prevent any spill or leakage of these substances.

815.07 CONTROL AND TREATMENT OF SILTED WATER

Silted or muddy water is not permitted to be released into any watercourse or water body or into any ditch or area that leads directly to a watercourse or water body. Runoff from adjacent areas shall be channeled, piped, diverted, or confined to prevent the water from entering construction zones and becoming polluted. Where due to rain events, runoff from construction zones and areas of exposed soils contains mud or silt, appropriate measures shall be taken by the Contractor to confine, settle, or channel such water so that adjacent watercourses or water bodies are not adversely affected. Such measures may include the provision of mud basins, settling basins, ditch blocks, silt fencing, temporary ditching, or other means necessary to prevent pollution. Silted runoff water or water released or pumped from construction zones may be discharged to an approved vegetated area where ground absorption will occur or to an approved settling area or to a settling basin constructed in accordance with contract drawings or as directed by the Engineer.

815.08 FILL PLACEMENT AT WATER BODIES

Fill material placed in or at water bodies shall be clean blasted rock. Where in the opinion of the Engineer, significant silty bottom sediments will disperse with potential of creating water quality problems, the fill zone shall be isolated from the remainder of the water body by such means as a silt curtain as approved by the Engineer. Rock shall be placed into the water zone so as to create the least amount of disturbance of bottom sediments. Rock shall be placed along the outer edge of the fill zone to close off and isolate the fill zone from the rest of the water body. Fill placement shall proceed with runs of rock along the inside of the first outer run of fill. Successive runs of rock fill shall be placed in this manner until the zone is filled back to the inner fill limits. Height of the placed rock fill shall be maintained a minimum of 300 mm above water level during fill operations. Equipment shall not operate in standing water zones. Removal of displaced sediments and/or bog shall be carried out as directed by the Owner. Pumping of water from the fill zone to a designated area may be required by the Owner to reduce water levels in the fill zone and prevent movement of silted water through the rock fill back into the water body.



TRANSPORTATION AND WORKS
HIGHWAY DESIGN DIVISION

TYPICAL TEMPORARY & PERMANENT BUFFER ZONES AT STREAM CROSSINGS

DRAWN BY:

DATE:

REV 02-01-10

NOT TO SCALE

JANUARY 2008

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SECTION 816 SILT FENCE

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- 816.01 SCOPE
- 816.02 MATERIALS
- 816.03 CONSTRUCTION
- 816.04 MAINTENANCE AND CLEAN OUT
- 816.05 REMOVAL
- 816.06 MEASUREMENT FOR PAYMENT
- 816.07 BASIS OF PAYMENT

816.01 SCOPE

This specification deals with the requirements for the provision, maintenance, and eventual removal of silt fence. Silt Fences are intended for reducing the amount of silt present in run off from highway projects during the construction process.

816.02 MATERIALS

The silt fence shall consist of a filter fabric fence held in place by posts. The filter fabric shall be of a weight of at least 200g/m². The fabric shall be at least 900mm wide. The fence posts shall be of sufficient length to support the fabric, be sturdy and be of dimensions of at least 50mm square. The staples shall be sufficiently sturdy to support the fabric for the required life of the fence.

816.03 CONSTRUCTION

The silt fence shall be constructed as shown on Form 1238 "Typical Silt Fence", and placed at the location, or locations, as required by the Engineer.

At the location required by the Engineer, the Contractor shall excavate a trench in a crescent shape across the projected flow path with ends pointing up slope. The trench shall have a width of approximately 100mm, and a depth of approximately 100mm.

The posts shall be secured at 3m intervals on the immediate down slope side of the trench.

The filter fabric shall be taken from a continuous roll, and cut to the required length. The filter fabric shall be stapled to the upstream side of the stakes, with 200mm of fabric extending into the trench and spread over the trench bottom.

The trench shall be backfilled and compacted to secure the fabric in the ground. The silt fence shall be properly constructed to ensure continuous protection along its perimeter. Under no circumstances are silt fences to be installed in a watercourse or waterbody.

816.04 MAINTENANCE AND CLEAN OUT

The Contractor shall maintain the silt fence, until such times as the Engineer requires that the silt fence be removed.

The Contractor shall carry out such silt and debris clean out, as required, in order that the silt fence continues to perform its function of reducing the amount of silt present in the run-off. Should the fabric become clogged, and rendered useless, then the Contractor shall replace the fabric with new fabric at his own expense.

816.05 REMOVAL

The Contractor shall remove the silt fence, when required to do so by the Engineer. The posts shall be taken out of the ground and the site cleaned up. Waste materials shall be disposed of in an approved waste disposal area, provided by the Contractor.

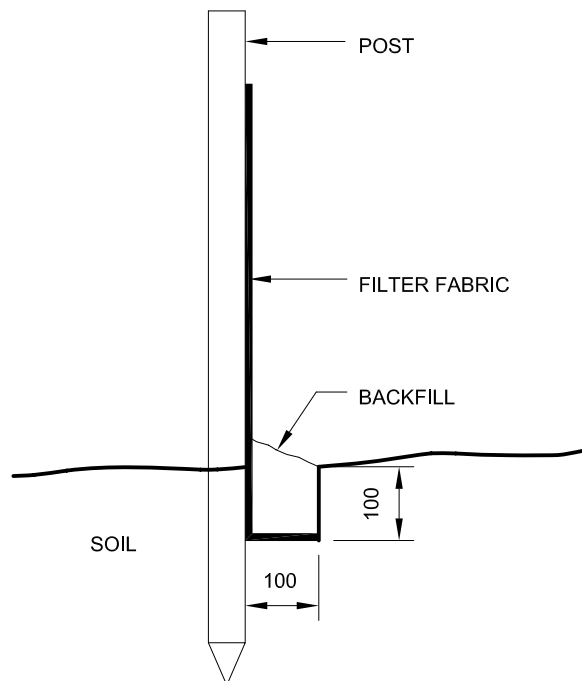
816.06 MEASUREMENT FOR PAYMENT

Measurement for payment will be made on the basis of the required length of fence installed, computed in metres rounded to one decimal place.

816.07 BASIS OF PAYMENT

FORM 816

Payment at the contract unit price for silt fence shall be compensation in full for all materials, labour and use of equipment: to supply the filter fabric, posts and staples, to excavate the trench, to install the posts, to secure the fabric to the posts, to backfill and compact the trench, to maintain and clean out the fence, to replace any worn out filter fabric with new fabric provided by the Contractor at his own expense, to remove the silt fence and posts, dispose of waste materials and clean up the site.



INSTALLATION OF GEOTEXTILE SILT FENCE

1. EXCAVATE A 100 x 100 TRENCH IN A CRESENT SHAPE ACROSS THE FLOW PATH WITH ENDS POINTING UPSLOPE.
2. DRIVE STURDY STAKES, SPACED 3000 APART, INTO THE GROUND ALONG THE DOWNSLOPE SIDE OF THE TRENCH.
3. INSTALL THE FILTER FABRIC FROM A CONTINUOUS ROLL AND CUT TO REQUIRED LENGTH. THE FILTER FABRIC SHOULD BE STAPLED TO THE UPSTREAM SIDE OF THE STAKES, EXTENDING THE BOTTOM 200 INTO THE TRENCH.
4. BACKFILL AND COMPACT THE SOIL IN THE TRENCH OVER THE FILTER FABRIC.



TRANSPORTATION AND WORKS
HIGHWAY DESIGN DIVISION

TYPICAL SILT FENCE

DRAWN BY: J. ROBERTS

DATE:

REV 02-01-10

NOT TO SCALE



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 817
CHECK DAM SEDIMENT TRAP

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- 817.01 SCOPE**
- 817.02 MATERIALS**
- 817.03 CONSTRUCTION**
- 817.04 MAINTENANCE AND CLEAN OUT**
- 817.05 DISPOSAL**
- 817.06 MEASUREMENT FOR PAYMENT**
- 817.07 BASIS OF PAYMENT**

817.01 SCOPE

This specification deals with the requirements for the provision, maintenance, and eventual disposal of a check dam sediment trap. Check dam sediment traps are intended for reducing the amount of silt present in run off from highway cuts during the construction process.

817.02 MATERIALS

The check dam sediment trap shall consist of rock fill with filter fabric on the upstream face held in place with small shot rock.

The filter fabric, and shall be of a weight of at least 200g/m².

The rock fill shall be clean rock, with rock fragments sized between 100 and 150mm.

The small shot rock shall be clean rock, with fragments no larger than 120mm.

817.03 CONSTRUCTION

The check dam sediment trap shall be constructed as shown on Form 1239 "Typical Check Dam Sediment Trap". The silty water storage area shall be excavated, and the check dam constructed, at the location as required by the Engineer.

817.04 MAINTENANCE AND CLEAN OUT

The Contractor shall maintain the checkdam, until such time as the Engineer requires that the check dam be removed.

The Contractor shall carry out such silt and debris clean outs as are required, in order that the check dam continue to perform its function of reducing the amount of silt present in the run-off.

817.05 DISPOSAL

The Contractor shall remove the check dam sediment trap, when required to do so by the Engineer.

On removal of the check dam, the fabric shall be disposed of in an approved waste disposal area provided by the Contractor. The ditch shall be cleaned up and graded to the required ditch cross section.

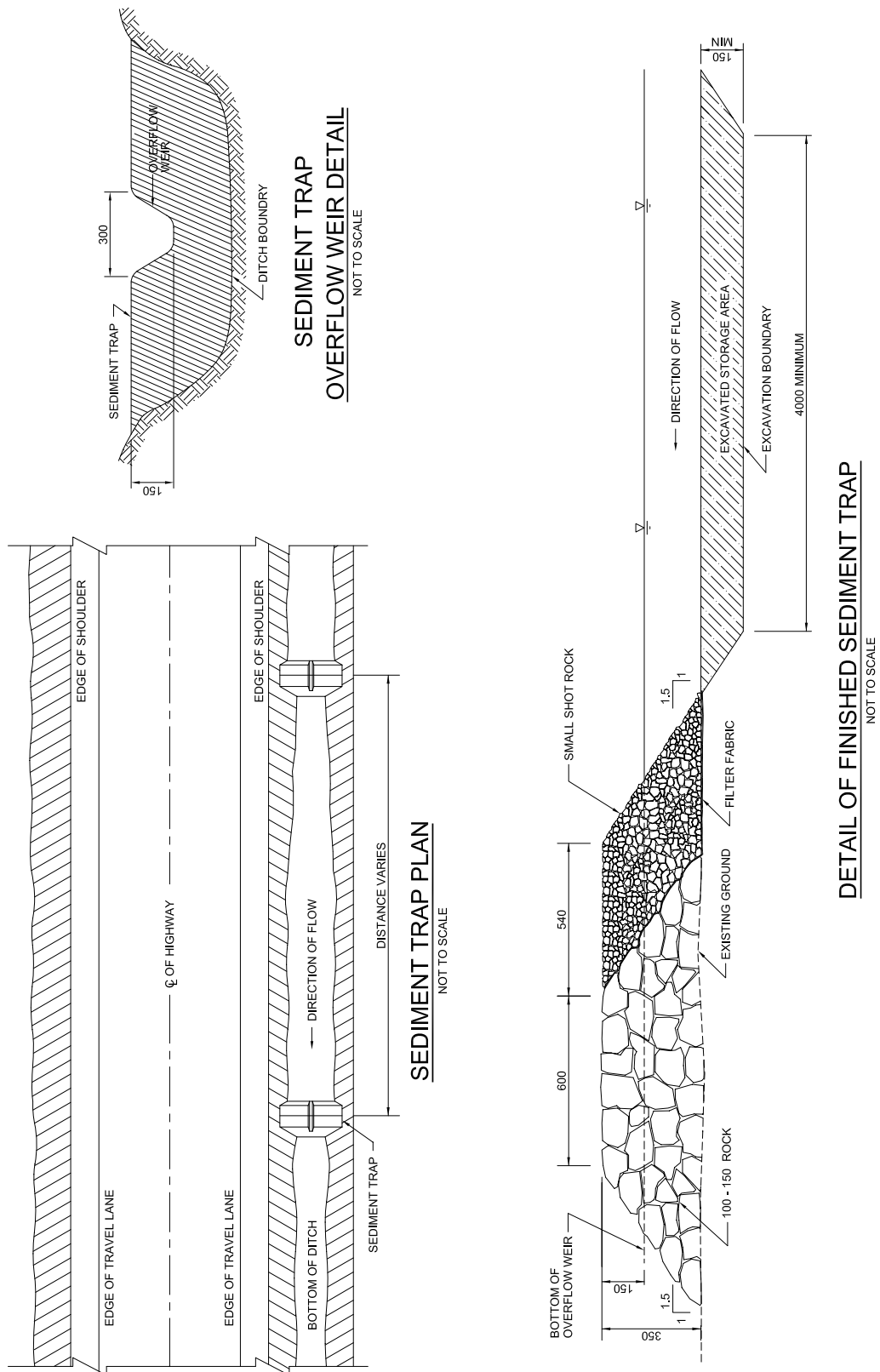
817.06 MEASUREMENT FOR PAYMENT

Measurement for payment will be based on the number of required check dam sediment traps constructed.

817.07 BASIS OF PAYMENT

Payment at the contract unit price for each check dam sediment trap shall be compensation in full for all labour, materials and use of equipment to: excavate the silty water storage area, load the rock fill and small shot rock at the source and haul to the check dam site, supply the filter fabric, construct the check dam as required, maintain and clean out the check dam sediment trap as required, and finally remove the check dam, dispose of the waste materials, clean up and grade the site.

The rock fill and small shot rock shall be paid for under: "Excavation hauled 1km or under - Solid Rock", Excavation hauled 1km or under - Ditching Solid Rock", or "Excavation hauled 1km or under - Quarried Rock", as applicable. However, any additional hand work required to sort the rock fill and the small shot rock to obtain the required size of fragments, and to grade the rock to the required check dam dimensions, shall be included in the payment for the check dam sediment trap.



TRANSPORTATION AND WORKS
HIGHWAY DESIGN DIVISION

CHECK DAM SEDIMENT TRAP

DRAWN BY: J. ROBERTS

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FORM 818



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 818

FLOATING SILT CURTAIN/TURBIDITY BARRIER

INDEX

818.01 SCOPE

818.01.01 General

818.02 MEASUREMENT FOR PAYMENT

818.03 BASIS FOR PAYMENT

818.01 SCOPE

This specification covers the supply, installation, and operation of a floating silt curtain or turbidity barrier.

Specific locations the Silt Curtain is to be used shall be designated by the Engineer.

818.01.01 General

The Contractor and Subcontractor(s) are required to comply with environmental protection measures contained in this section and all applicable environmental protection regulations of Federal, Provincial, and Municipal Authorities.

This specification is to be used in applications where a floating silt curtain/turbidity barrier is specified to be used around the leading edge of the advancing fill for construction operations to control any silt that may be generated from the bottom of the fill or other materials that may be used in construction of the road or other structure in a submerged portion of a water body. The turbidity barrier is to be a floating silt curtain (such as Brockton Equipment/Spilldam, Inc. Siltdam Type I) meeting the requirements of the Federal Department of Fisheries and Oceans. This item may be designed locally but must adequately control and prevent the migration of silt or other deleterious substances from the work area to the main water body. The turbidity barrier system must be approved with shop drawings/literature stamped by a professional engineer registered in the province of Newfoundland and Labrador submitted prior to its use.

The turbidity curtain is to consist of the following elements or approved equivalents: 304mm diameter flotation, 22oz polyvinylchloride (PVC) float cover, 8mm PVC coated top tension cable, silt film skirt to required depth to reach from water surface to the water body bottom, 9.5mm galvanized ballast chain, polyplate/lacing grommets (ends).

The turbidity barrier is to be anchored at 15m intervals. The anchoring system will consist of Mushroom style anchors or other suitable type anchors for the bottom condition present, yellow inflatable cautionary mooring buoys, and nylon mooring line or approved equivalents. Where navigation conditions are present in the area of the turbidity curtain the cautionary buoys shall be lighted and a plan will be required to be submitted for approval showing where the buoys are to be located.

The turbidity barrier shall be a minimum of 100m in length but may be otherwise specified in the Unit Price Table. The barrier will form a long arc extending from the shoreline approximately 35m, across the work zone (parallel to the shore) approximately 30m, and back to the shoreline for approximately 35m. The barrier is to be installed to reach the bottom of the water body from the water surface. Installation plan can be seen on the drawing titled "Silt and Bubble Curtain", as shown on Form 1223 of the Specifications.

As the leading edge of the fill advances, and the work site changes, the turbidity barrier will have to be moved and reinstalled. Movement of the turbidity barrier shall be considered incidental to the work and should be included in the price for the turbidity barrier.

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In addition to these requirements for use of the turbidity curtain for permanent works in the contract the contractor will be required to use a turbidity barrier for any temporary works requiring installation or removal of fill in the construction in the water body. The contractor may reuse the turbidity barrier required for use for the permanent works installation in the water body for a contract, but at all times during installation or removal of fill in the water a turbidity barrier may be required to be used.

818.02 MEASUREMENT FOR PAYMENT

Measurement will be based on a per contract basis for the Floating Silt Curtain/Turbidity Barrier by the Engineer. Fifty percent of the total of the item will be paid on the progress estimate after which the silt curtain has been deployed for its intended use, and fifty percent will be paid on the last progress estimate where the in water body construction operation has been completed.

818.03 BASIS OF PAYMENT

Payment for the turbidity barrier will be lump sum. Payment shall be for compensation in full for engineering, design, transportation to site, installation, removal, reinstallation, equipment, labour, and all other materials necessary to complete the above, at the locations indicated to be used on the contract.



SECTION 820

STORAGE AND HANDLING OF FUELS AND OTHER HAZARDOUS, TOXIC, OR DANGEROUS MATERIAL

INDEX

- 820.01 STORAGE TANK REGISTRATION, INSPECTION, AND REMOVAL
- 820.02 SPILL REPORTING AND CLEANUP PROCEDURES
- 820.03 FUEL STORAGE AND HANDLING PROCEDURES
- 820.04 EQUIPMENT SERVICING PROCEDURES
- 820.05 USE OF HAZARDOUS, TOXIC OR DANGEROUS MATERIAL

820.01 STORAGE TANK REGISTRATION, INSPECTION, AND REMOVAL

All storage tank systems must be registered under and in compliance with Newfoundland Regulation 58/03, The Storage and Handling of Gasoline and Associated Products Regulations, 2003 before commencing operation. Registration does not apply to storage tank systems of a capacity less than 2500 litres that are connected to a heating appliance. Contractors shall supply verification of storage tank registration to the Engineer prior to the commencement of work.

Storage tank systems shall be operated as per Section 18 of Newfoundland Regulation 58/03 Storage and Handling of Gasoline and Associated Products. This involves, but is not limited to, gauging or dipping, reconciliation of records, and the proper maintenance of reconciliation records for a period of two years. Records shall be maintained for inspection by the Engineer, ESO and/or Government Service Centre Inspectors.

The operator of a storage tank system shall, within 30 days of known abandonment, empty the system of all products, remove the tank and associated piping from the ground, remove any contaminated soil, clean the area and restore the site to the satisfaction of the Engineer and in accordance with the criteria of the Government Services Centre.

820.02 SPILL REPORTING & CLEANUP PROCEDURES

The Contractor, Subcontractors, and their personnel shall take all necessary precautions to prevent the spillage, misplacement, or loss of fuels and other hazardous material.

The Contractor and Subcontractors shall abide by the following measures in the event of the detection of a fuel or hazardous material spill of 70 litres or more:

- (i) make every effort to stop leakage and contain contaminant flow;
- (ii) **immediately** upon detection, report spill location and size to the Canadian Coast Guard spill report number **772-2083**, Pesticides Control Section 729-3395 and to the Owner; follow up with a full written report containing information on the cause of the spill, remedial action taken, damage or contamination estimate, and any further action to be taken;
- (iii) remove contaminant from spill site by absorbent, pumping, burning, or whatever method is appropriate and acceptable to Owner. Clean-up the affected area in accordance with the requirements of the Government Services Centre and then dispose of contaminated debris at an approved waste disposal site.
- (iv) take all necessary action to ensure the incident does not recur.

The Contractor shall apply the following criteria in reaching decisions on contaminant and clean-up procedures:

- (i) minimize danger to persons;
- (ii) minimize pollution to watercourses and wetlands;
- (iii) minimize the size of the area affected by a spill; and
- (iv) minimize the degree of disturbance to the area and watercourses during clean-up. Any spillage of hydrocarbons less than 70 litres shall be immediately cleaned up by the Contractor and reported promptly to the Engineer.

The Contractor shall dispose of any soil contaminated by small leaks of oil or lubricating fluids from equipment in a manner approved by the

Engineer and in accordance with the criteria of the Government Services Centre. The Contractor shall have on site a suitable quantity of absorbent material such as "Oclansorb" or similar product which can be accessed quickly and effectively in the event of **any** hydrocarbon spill. The contractor shall advise fuel handling staff of its location and application.

820.03 FUEL STORAGE & HANDLING PROCEDURES

Contractor shall ensure that fuels and hazardous materials are handled only by personnel who are trained and qualified in handling these materials in accordance with manufacturers' instructions and government regulations. The Contractor will be required to verify personnel qualifications as they pertain to this item and provide written confirmation of same to the Engineer. The Contractor shall supply a copy of the product safety data sheet to the Engineer of all hazardous, toxic or dangerous materials or substances which will be used during the course of the contract. Refuelling operations shall be supervised at all times. Under no circumstances shall any refuelling procedure be left unattended by the operator.

Handling and fueling procedures shall be carried out to prevent the contamination of soil or water. Smoking shall be prohibited within **10 m** of a fuel storage area or during refuelling operations. Fuelling or servicing of mobile equipment shall not be allowed within **100 m** of a watercourse, water body, or designated wetlands. Oils, greases, gasoline, diesel, hydraulic and transmission fluids or other fuels shall be stored at least **100m** (horizontal distance) from any water course, water body, or designated wetland unless otherwise approved by the Engineer.

Any above ground fuel containers, with the exception of those exempted under Newfoundland Regulation 58/03, shall be self dyked units that are in compliance with the terms and conditions of the approval of the Government Services Center. Fuel storage areas and non-portable transfer lines shall be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers shall be visible under all weather conditions. The storage, handling and disposal of **used oils** shall be in accordance with the Used Oil Control Regulations (82-02) under the NL Environmental Protection Act..

820.04 EQUIPMENT SERVICING PROCEDURES

All heavy equipment maintenance shall be carried out by using suitable fluid collection equipment and in a manner which ensures all waste material is collected and suitably disposed of. The Contractor shall ensure that all equipment is mechanically sound to avoid leaks of grease, oil, diesel, gasoline, and hydraulic and transmission fluids. The Contractor shall ensure that no servicing or washing of heavy equipment occurs adjacent to watercourses and designated wetlands. Fueling, servicing or washing of equipment shall not be allowed within **100 m** of a watercourse except within a refueling site approved by the Engineer where conditions allow for containment of accidentally spilled fuels. The Contractor shall remove from the work area and properly dispose of all waste oil, filters, containers or other such debris at an approved waste disposal site.

820.05 USE OF HAZARDOUS TOXIC OR DANGEROUS MATERIAL

Toxic construction material e.g., creosote treated timber, shall be stored at least **100 m** away from all areas where drainage is directed into any watercourse or wetlands.

Toxic or dangerous substances such as form release agents, fuels, concrete additives (including superplasticisers), and other such substances, shall be transported, stored, and handled with all necessary precautions so as to prevent any spillage from occurring. Drip pans shall be used at locations where such liquids are being drawn off in order to contain any minor spills, and as a safety measure for containment of a significant spillage.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 825

WASTE MANAGEMENT

INDEX

825.01 SOLID WASTE DISPOSAL

825.02 SANITARY FACILITIES/SEWAGE DISPOSAL

825.01 SOLID WASTE DISPOSAL

The Contractor shall collect and dispose of all waste produced by its employees and those of its Subcontractors in a manner approved by the Engineer, and in accordance with the Newfoundland and Labrador Environmental Protection Act, 2002. Through the placement of suitable containers at the site, the Contractor shall collect and dispose of rubbish and domestic garbage generated by employees. During the progress of the work, the Contractor shall keep the areas occupied by it and access to such areas in a neat, clean, and safe condition, and free from the accumulation of all waste materials including crating materials, rubbish, drink containers, cigarette cartons, and all other waste. All solid waste shall be removed from the job site and recycled or disposed of at an Approved Waste Disposal Site, with the permission of the municipal authority. No waste material shall be deposited in any watercourse or wetland.

Upon completion of the work the Contractor shall, at its own expense, and to the satisfaction of the Engineer, dispose of or remove from the job site all construction plant, rubbish, unused material, including concrete forms, filter fabric material, sediment fencing, sand bags, and other equipment and materials belonging to it or used under its direction during the performance of the work. The site shall be left in a neat and clean condition.

In the event of the Contractor's failure to comply with any of the foregoing, the same may be accomplished by the owner within **30 days** of the completion of the work and the cost of same may be deducted from any money due or owing to the Contractor whether under this or any other contract.

825.02 SANITARY FACILITIES / SEWAGE DISPOSAL

The Contractor shall maintain portable latrines on site or systems approved by the Government Services Center. The sanitary facilities shall be used by all Contractor employees and those of subcontractors. The Contractor shall transport the waste from these units, using a collection company (whenever possible) licensed by Government Services Center. Otherwise, transportation and disposal shall be by a means and at a facility or location as approved by the Government Services Center.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 830
MARSHALING YARDS & TEMPORARY WORK CAMPS

MARSHALING YARDS & TEMPORARY WORK CAMPS

Equipment or material storage yards and temporary work camps shall be located at least **100 m** from any watercourse or designated wetland.

The Contractor is responsible for obtaining **all** appropriate permits from government agencies with legislation and regulations relevant to camp facilities. These permits include, but are not necessarily limited to, those related to: solid and liquid waste disposal, water supply, sewage treatment, development control, Crown Lands, and any Municipal Authority having jurisdiction over the area.

Any site proposed for a marshaling yard or work camp should be of low value with respect to its potential for other uses when compared to other lands in the area. Abandoned gravel pits, abandoned commercial enterprises, or other previously disturbed areas are preferred locations. Any site must be located so as to minimize potential traffic hazards. Incoming and outgoing vehicles should be able to merge safely with other traffic. Prior to the commencement of construction the Contractor will submit a list of candidate sites, which will be reviewed and approved by the Engineer and any other relevant agency.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 835
FOREST FIRE PREVENTION

FOREST FIRE PREVENTION

The Contractor shall obtain a burning permit as may be required by the Forestry Division of the Department of Natural Resources, where burning is to be conducted, and shall abide by the terms and conditions of the permit.

The Contractor shall take all precautions necessary to prevent fire hazards when working at the job site and shall keep the job site free of all flammable waste.

Fires shall be located a minimum of **10m** from the existing tree line or adjacent piles of slash. Fires and slash piles will be kept to small manageable sizes to prevent igniting or scorching of adjacent vegetation.

The Contractor shall have available, in proper operating condition, sufficient fire fighting equipment, as recommended by the Forestry Division of the Department of Natural Resources, to suit its location, labour force, and construction plant. Such equipment shall comply with the standards of, and have approvals of, Underwriters Laboratories of Canada Limited and shall be maintained in accordance with National Fire Prevention Association Codes.

The Contractor shall ensure that specific employees are assigned to and trained in the use of fire fighting equipment. A list of these personnel shall be available on request by the Owner.

Rubber tires, waste oil, or similar material shall not be used to ignite slash or used to maintain the burning operation.

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GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and works
Highway Design Division

SECTION 840 DUST CONTROL

DUST CONTROL

The Contractor shall ensure that dust does not become a problem for adjacent property owners or construction site personnel or a hazard to vehicular traffic. When required, or as directed by the Engineer, water or an acceptable dust suppressant such as calcium chloride shall be used by the Contractor on haul routes or other locations on the project to control dust.



SECTION 845

EQUIPMENT OPERATION AND PREVENTION OF EROSION AND SILTATION

INDEX

845.01 STORM WATER MANAGEMENT

845.02 TEMPORARY TRAVEL ROUTES

845.03 EROSION CONTROL MEASURES

845.04 LIMITATION OF OPERATIONS

845.01 STORM WATER MANAGEMENT

The Contractor is responsible for storm water and drainage management during the period of the contract. This includes the collection, channeling, containment, settling, discharge and any other operation to effectively control storm runoff and prevent problems of erosion or siltation of adjacent or downstream areas. (See Section 815.07 Control and Treatment of Silted Water).

845.02 TEMPORARY TRAVEL ROUTES

Linear travel along the right of way by vehicles and equipment shall be restricted to one track or travel route, particularly during the early stages of opening access along the route, unless otherwise approved by the Engineer. The route shall be maintained by the Contractor free of standing water. Surface drainage will not be permitted to run along the route which can generate extensive mud and silt, and adversely affect materials to be excavated such as grubbing, unsuitable material, and overburden. Surface drainage shall be vented off the route at frequent intervals. Where drainage courses are encountered, and frequent crossings are required, temporary pipes (CSP or iron) shall be installed to permit passage of equipment and vehicles in the dry, without causing erosion and siltation. At certain locations fording may be permitted by the Engineer. (See Section 815.03 Fording of Watercourses).

845.03 EROSION & SILT CONTROL MEASURES

845.03.01 GENERAL PROTECTION MEASURES

The Contractor shall minimize terrain disturbance and erosion resulting from its activities. The Contractor shall, as part of its work, implement erosion and silt control measures where its activities result in a blockage of natural drainage, the diversion of natural drainage, or the exposure of soil or subsoil to potential erosion. Particular measures which may be required include:

- (i) using an erosion control blanket;
- (ii) using an appropriate hydraulic mulch;
- (iii) spreading hay over exposed soils;
- (iv) spreading a thin layer of brush or slash over disturbed areas;
- (v) the installation of baffles or sediment traps at appropriate intervals within the area of disturbance;
- (vi) the installation of drainage collectors across the disturbed area to channel drainage into vegetated areas;
- (vii) the re-routing of disturbed drainage courses back into the natural course;
- (viii) the stabilization of exposed soils at drainage locations with appropriate rip-rap;
- (ix) where so directed by the Engineer, to construct check dams to confine mud or slurry at such locations as unsodded ditch lines, catch-basins and culvert inlets.
- (x) the pumping of silted water to settling or designated vegetated areas;
- (xi) the installation of sedimentation basins of adequate size at run-off locations from exposed areas to contain heavy silt and mud as directed by the Engineer.

845.04 LIMITATION OF OPERATION

During periods of heavy rain, where in the opinion of the Engineer, the movement of excavated material and equipment may give rise to extensive mud conditions, or the potential to seriously impact watercourses, or adjacent land, the Contractor may be required to suspend operations until such time as site conditions allow operations to resume. The Contractor shall not be paid for such downtime.



SECTION 850

PROTECTION OF VEGETATION AND WETLANDS

INDEX

850.01 MAINTAIN NATURAL DRAINAGE PATTERN

850.02 PROTECTION OF TREES AND SHRUBS

850.03 OFF RIGHT OF WAY TRAVEL

850.04 BOGS AND WETLANDS

850.01 MAINTAIN NATURAL DRAINAGE PATTERN

Drainage is to be maintained in its natural state wherever possible, with provision being made for spring flooding. Where existing drainage patterns cannot be maintained, alternate drainage will be installed to approximate normal conditions with the approval of the Engineer.

850.02 PROTECTION OF TREES & SHRUBS

Some trees, shrubs and plants within the clearing limits may be required for use by the Owner or other groups. Where necessary, and as directed by the Engineer, such trees, shrubs and plants shall be flagged for removal. Also see Section 855.02 (Planting Of Trees and Shrubs).

Where branches of trees are to be removed as a result of damage or where roots **2.5 cm** in diameter or larger are exposed as a result of contractors excavation work, the stumps shall be cut cleanly using a saw or lopping tool. The roots shall be cut back level to the surface of the cut slope within 24 hours following their exposure.

The Contractor shall adhere to the following protection measures:

- (i) No unnecessary cutting of trees is to be conducted. Care will be taken during construction to prevent damage to trees and shrubs adjacent to the flagged clearing limits which are to remain after construction.
- (ii) Care shall be taken when sloping embankments not to expose roots of trees, or put the soil at the base of such trees in danger of future erosion or extensive downslope drainage.
- (iii) The Contractor shall not use living trees as survey marks and shall not cut blazes or otherwise mark live trees except with removable surveyor's tape and/or tags.
- (iv) Where cutting is necessitated, the Contractor shall stockpile and remove all merchantable timber not required by the Owner. Other wood waste and slash remaining near the uncut zone shall be disposed of by chipping, burning, or removal, as acceptable to the Engineer.

850.03 OFF RIGHT OF WAY TRAVEL

The Contractor shall limit equipment travel to the surveyed right-of-way and existing municipal and provincial roads. Use of equipment of any type is not permitted outside the clearing limits of the right of way without prior approval. To obtain approval for additional or new travel routes, the Contractor shall notify the Engineer a minimum of five working days in advance of such requirements and not commence work until written approval is given by the Engineer.

850.04 BOGS AND WETLANDS

Bogs and wetlands are considered sensitive terrain because of their high disturbance potential. Travel by machinery across bogs and wetlands shall be avoided whenever possible. When such travel is necessary, it shall be carried out as directed by the Engineer. Bog excavation shall conform with good construction practices and be carried out in accordance with other relevant sections of these specifications.



SECTION 855 REVEGETATION

INDEX

855.01	REVEGETATION FOR SURFACE STABILIZATION
855.02	PLANTING OF TREES AND SHRUBS
855.02.01	GENERAL INSTRUCTION
855.02.02	PLANTING METHODS AND MAINTENANCE
855.02.03	PAYMENT AND WARRANTY

855.01 REVEGETATION FOR SURFACE STABILIZATION

Immediately following and during some construction activities, the Engineer will identify areas requiring seeding/sodding or stabilization by a method to prevent erosion. These will include:

- (i) Extensive cuts in overburden material. These areas shall be hydro seeded within **three** calendar days of a cut being prepared and the work shall be carried out as directed by the Engineer;
- (ii) Stream crossing sites. Topsoil placement, sodding, and shrub or tree plantings may be required as directed by the Resident Engineer.
- (iii) All remaining disturbed areas, designated, will be hydro seeded or sodded as soon as possible in accordance with the DWST Specification Book - Section 632- Hydroseeding, Section 634 - Soil for Hydroseeding, Section 635- Lime for Hydroseeding, and Section 633- Sodding.

Where the potential for erosion exists, as on steep slopes, long slopes, or soft erodible type material, an appropriate erosion control material shall be applied to the surface. This can be in the form of an erosion control fabric or a sprayed on erosion control product which is approved by the Engineer and which will be in addition to hydroseeding as indicated in the contract documents or as directed by the Resident Engineer. Also see Section 845.03 (Erosion and Silt Control Measures).

The Engineer will inspect all revegetated areas periodically to ensure that adequate results have been achieved. During adverse dry conditions watering of revegetated areas shall be carried out as directed by the Engineer. Additional REVEGETATION work will be undertaken upon direction from the Engineer if the desired results are not achieved.

855.02 PLANTING OF TREES AND SHRUBS

855.02.01 GENERAL INSTRUCTIONS

The planting of trees will be carried out in those areas identified in the contract documents. The types of species, quantity, size, and exact location will be specified in the contract documents or otherwise the Contractor will be advised by the Engineer. **Nursery stock**, (purchased trees and shrubs in pots), or **site stock**, (trees and shrubs removed from a site and held over or planted out directly), may be used as specified in the contract documents or as directed by the Engineer.

Native species of trees and shrubs are generally preferred, however, non-native species may be specified where, for example, a faster growing species or a disease resistant species or variety is needed.

FORM 855

The following species of trees are recommended:

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
PICEA	SPRUCE	ACER SPICATUM	MOUNTAIN MAPLE
ABIES BALSAMEA	FIR	ACER RUBRUM	RED MAPLE
BETULA PAPYRIFERA	BIRCH	ACER PLATANOIDES	NORWEGIAN MAPLE
SORBUS	DOG BERRY	SALIX DISCOLOR	WILLOW
LARIX LARICINA	LARCH, JUNIPER	SALIX BEBBIANA	WILLOW
LARIX KAEMPFERI	JAPANESE LARCH	POPULUS TREMULOIDES	TREMBLING ASPEN, POPLAR, APS
PRUNUS PENNSYLVANICA	PIN CHERRY	POPULUS BALSAMEA	COTTONWOOD, BALSAM POPLAR

The following species of large shrubs are recommended:

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
AMELANCHIER	CHUCKLEY PEAR	CORYLUS CORNUTA	HAZELNUT
VIBURNUM CASSINOIDES	NORTHERN WILD RAISON	ARONIA MELANOCARPA	EASTERN CHOKEBERRY, CHOKECHERRY
ALNUS CRISPA	ALDER	ARONIA PRUNIFOLIA	EASTERN CHOKEBERRY, CHOKECHERRY
CORNUS STOLONIFERA	RED OSIER DOGWOOD		

The following species of small shrubs are recommended:

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
MYRICA GALE	SWEET GALE, BOG MYRTLE	SAMBUCUS PATENS	RED ELDERBERRY
RHODODENDRON CANADENSE	RODORA	ROSA NITIDA	WILD ROSE
NEMOPANTHUS MUCRONATA	MOUNTAIN HOLLY	ROSA VIRGINIANA	WILD ROSE
VIBERNUM EDULE	SQUASHBERRY	RUBUS IDAEUS	RED RASPBERRY
CHAMAEDAPHNE CALICULATA	LEATHERLEAF	SPIRAEA LATIFOLIA	MEADOWSWEET

855.02.02 PLANTING METHODS AND MAINTENANCE

The Contractor is referred to the **Manual for Native Plant Material Recovery**, available from the Department of Transportation and Works, for general information and recommended practices for the removal of trees and shrubs for either planting out directly or holding over for subsequent planting, and other aspects of care and maintenance.

All trees and shrubs do best when planted in early spring prior to the buds opening, but may also be successfully planted in late fall during their dormancy period. While it is possible to plant trees and shrubs at any time of the year, a regular watering program prepared by the Contractor and approved by the Resident Engineer to reduce or prevent mortalities is required during the active growing period. A watering program is required for all planted stock (nursery stock or site stock) in the first year. This should commence as soon as active growth begins, and as determined by the prevailing weather conditions and dryness of the soil throughout the growth season. Watering and other necessary maintenance such as the provision of staking or supports, pruning, mulching, etc. is the responsibility of the Contractor and no extra compensation will be paid for these items.

855.02.03 PAYMENT AND WARRANTY

Measurement for payment shall be by the number of individual trees of the specified species and size planted. The Contractor is responsible for preventing mortalities in planted stock. Trees and shrubs which die within 18 months of being planted shall be replaced by the Contractor at no additional cost to the Owner.



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 860
PROTECTION OF HISTORIC RESOURCES

PROTECTION OF HISTORIC RESOURCES

The Contractor shall be aware that the Historic Resources Act (1985) requires the protection of archaeological sites and artifacts, and sets forth procedures to be followed in the event that either are found. The Contractor shall be aware of the following sections of the Act:

- Section 10(1) - A person who discovers an archaeological object in, on, or forming part of the land within the province shall report the discovery forthwith to the Minister stating the nature of the object, the location where it was discovered and the date of the discovery.
- Section 10(2) - No person, other than the one to whom a permit has been issued under this Act, who discovers an archaeological object shall move, destroy, damage, deface or obliterate, alter, add to, mark or in any other way interfere with, remove or cause to be removed from the province that object.
- Section 11(1) - The property in all archaeological objects found in, on or taken from the land within the province, whether or not these objects are in the possession of Her Majesty is vested in Her Majesty.

Should any archaeological remains be encountered, such as stone, bone or iron tools, concentrations of bone, fireplaces, house pits and/or foundations, work in the area of the find shall cease immediately. The Contractor shall immediately notify the Owner through the Engineer, or the Senior Environmental Planner, or the Environmental Surveillance Officer immediately upon discovery of any historic resources. The Owner shall immediately notify the Historic Resources Division.

**SECTION 865****OTHER ENVIRONMENTAL REQUIREMENTS**

The Contractor shall be aware that other environmental requirements are contained in other sections. The attention of the Contractor is directed to:

SECTION 180	UNWATERING INCIDENTAL TO WORK
SECTION 201	CLEARING AND GRUBBING
SECTION 202	CLEARING
SECTION 203	GRUBBING
SECTION 204	GRADING OF FILL
SECTION 207	BORROW
SECTION 208	EXCAVATION OF DITCHES
SECTION 305	APPLICATION OF CALCIUM CHLORIDE
SECTION 310	USE OF PITS, QUARRIES, AND STOCKPILES FOR PRODUCTION OF MATERIALS SUPPLIED BY CONTRACTOR
SECTION 317	WINTER SAND
SECTION 320	TACK COAT
SECTION 330	HOT MIX ASPHALTIC CONCRETE
SECTION 401	DITCHING FOR OF STREAMS
SECTION 402	PERMANENT DIVERSION OF STREAMS
SECTION 403	EXCAVATION FOR FOUNDATIONS
SECTION 405	TEMPORARY DIVERSION OF STREAMS
SECTION 421	INSTALLATION OF PIPE CULVERTS
SECTION 423	SUPPLY AND INSTALLATION OF STRUCTURAL PLATE PIPE
SECTION 424	SUPPLY AND INSTALLATION OF STRUCTURAL PLATE ARCH
SECTION 426	DESIGN, SUPPLY, AND INSTALLATION OF LONG SPAN STRUCTURAL PLATE ARCH
SECTION 520	STORAGE OR DISPOSAL OF OLD ASPHALTIC PAVEMENT
SECTION 521	DEMOLITION AND REMOVAL OF SIDEWALKS, CURB AND GUTTER, MANHOLES, CATCH BASINS, DITCH INLETS, FENCES, GUIDE RAIL AND GUIDE POSTS
SECTION 522	DISPOSAL OR SALVAGE OF CULVERT OR PIPE
SECTION 634	SOIL FOR HYDROSEEDING
SECTION 635	LIME FOR HYDROSEEDING
SECTION 632	HYDROSEEDING
SECTION 902	EXCAVATION FOR FOUNDATION, UNWATERING AND EXTRA BACKFILL FOR STRUCTURES
SECTION 914	BRIDGE DECK WATERPROOFING

Appendix C:

Technical Information, DFO Fact Sheets

FACTSHEET

Effects of Silt on Fish and Fish Habitat

Department of Fisheries and Oceans

Silt refers to the fine grained sediment particles which are sometimes transported in the water column. Turbidity is a term used to refer to the "cloudiness" created in the water column by the suspended sediment (silt) particles.

Some of the adverse impacts of suspended sediment include:

- Abrasion of gill membranes.
- Impairment of feeding due to increased turbidity (salmon and trout are visual feeders).
- Fatal impacts to small aquatic animals which are food organisms for trout and salmon.

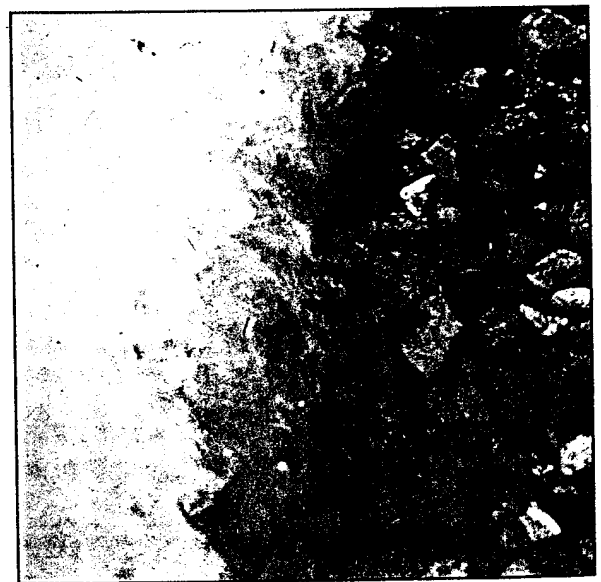
Some effects of deposited silt particles include:

- Clogging of small spaces between gravel particles preventing the free flow of oxygenated water and removal of waste products from developing eggs deposited in the gravels. This often causes suffocation and egg mortalities and may leave such gravel beds unsuitable for future deposition of eggs.
- Destruction of the habitat of small stream bottom dwelling animals that provide food for trout and salmon.

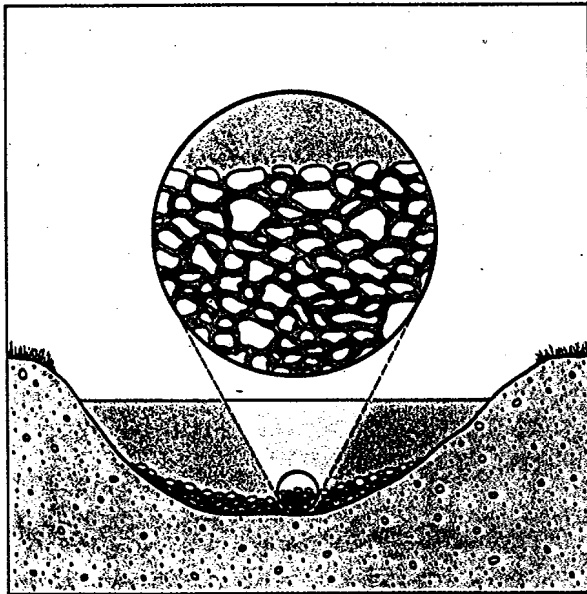
- Elimination of sheltered areas between boulders and gravel particles which are important features for juvenile fish.

Silt can enter a waterbody as a result of:

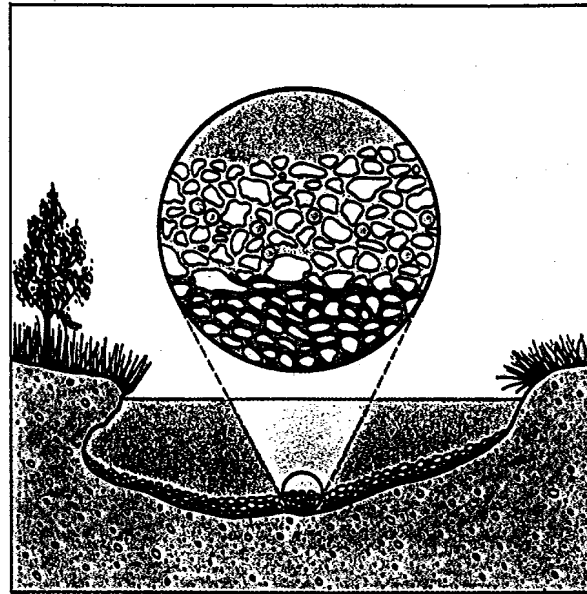
- Erosion of exposed soils, often as a result of disturbance by man (eg. improper stream crossings or instream works such as utilization of stream beds as traffic routes by heavy equipment).
- Release of fine particles from some sort of mechanical process (i.e. mine tailings or rock crushing).



For most construction or development projects which cause production of silt, there are methods which are effective for removing suspended sediment from site water and preventing it from entering streams or lakes. Specific methods are outlined in other DFO fact sheets in this series.



Silted gravel stream bottom.



Clean gravel stream bottom.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



Fisheries and Oceans
Pêches et Océans

Canada

FACTSHEET

Blasting - Fish and Fish Habitat Protection

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

Fish and fish habitat protection should be provided for blasting activities that are planned in or near a freshwater or marine waterbody. Blasting in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

CONSIDERATIONS

- Blasting plans should be developed such that the weight of charge (in kilograms (kg)) to be detonated at any precise moment is small.
- For multiple charges, time-delay detonators (eg., blasting caps) should be used to reduce the overall detonation to a series of single explosions separated by a minimum 25 milliseconds (1/1000 seconds) delay (see Figure 1).
- Large charges should be subdivided into a series of smaller charges (ie. decking) in blast holes with a minimum 25 millisecond delay between charge detonations (see Figure 1).
- The on-land set-back distance from the blast site to the waterbody or the set-back distance (zone) around the

blast site in the waterbody are based on the maximum weight of charge to be detonated at one instant in time (see Table 1) and the type of fish and fish habitat in the area of the blast.

- Blast holes should be back-filled (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
- Blasting mats should be placed atop the holes to minimize scattering of blast debris around the area.
- Ammonium nitrate based explosives must not be used in or near water due to the production of toxic by-products.
- Blasting activities are not to be carried out in the marine environment within 500m of marine mammals (additional mitigative measures may also be necessary).

IMPLEMENTATION PROCEDURES

- Blasting activities are to take place at a set-back distance from the waterbody as indicated on Table 1. If on-land blasts are required nearer to the waterbody than indicated on Table 1, then additional mitigative measures should be put in place.

Mitigative measures for blasting in or near a waterbody may include, but are not limited to; installation of bubble/air curtains (ie. a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose) to disrupt the shock wave, blasting during less sensitive fishery periods, isolation of the work area from fish movement, detonation of small scaring charges (ie., detonator caps or short lengths of detonating cord) set off one minute prior to the main charge to scare fish away from the site or the use of noise generators to move fish out of the area. When a bubble curtain is used, it should surround the blast site and be started-up only after fish have been moved outside of the surrounded area.

DFO should be contacted regarding the proposed blasting program prior to start-up.

MAINTENANCE / ABANDONMENT

- All blasting debris and other associated equipment/products are to be removed from the blast area, including any debris that may have

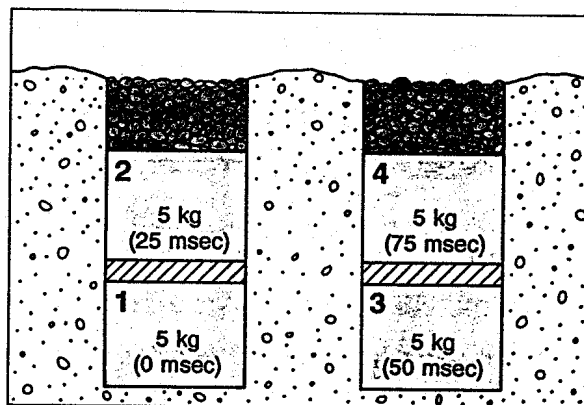
entered the freshwater or marine waterbodies.

Table 1. Set-back Distance in Metres (m) from Blast Site to Fish Habitat for Rock Removal*

Habitat	Weight of Explosive Charge(kg)					
	0.5	1	5	10	25	50
H1	7	10	15	20	35	50
H2	15	20	45	65	100	143

* Set-back distances may vary slightly depending upon specific circumstances. Habitat H1 includes rearing/general fish habitat. H2 includes spawning habitat where eggs or early fish development are occurring.

Figure 1. Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes; and decking of charges within holes. As per Table 1, for Fig. 1 example, for a 5 kg weight of charge a 15 m set-back from rearing habitat and a 45 m set-back from spawning habitat should be provided.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Ditching

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

All roads require proper drainage in order to support traffic. The manner in which ditching is carried out not only affects drainage, but fish habitat as well.

CONSIDERATIONS

- Roadside ditches, particularly new ditches, can transport large volumes of silt and sediment. If this material is discharged into streams it adversely affects fish and other aquatic life.

IMPLEMENTATION PROCEDURES

In order to avoid damage to fish habitat, the following measures should be implemented:

- Cross drainage culverts and take-off ditches should be incorporated to carry water away from the road and into the surrounding vegetation, where sediments can be filtered from the water.
- In addition to take-off ditches, road side ditches with long slopes may require checkdams to reduce flow velocity, control erosion, and prevent siltation of nearby streams.
- Where the topography does not permit the construction of take-off ditches, settling basins should be used to trap silt before it enters nearby streams.
- Where ditches have been excavated in areas with erosion prone soils, the ditches should be immediately lined with non-erodible material.



MAINTENANCE

- Maintenance of drainage ditches includes regular inspection and the removal of accumulated sediments.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

McCubbin, R.N. et al. 1990. (Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

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For more information contact the nearest
Department of Fisheries and Oceans office.



Fisheries and Oceans
Pêches et Océans

Canada

FACTSHEET

Temporary Ford

Department of Fisheries and Aquaculture

CONDITIONS WHERE APPLICABLE

Where there is a need for infrequent crossings and a suitable site exists, fording or travelling through a water course, may be an acceptable method of crossing streams.

CONSIDERATIONS

- Approaches to the crossing site should be stable and have low slope.
- The streambed at the proposed crossing site should consist of bedrock or large rubble material. Known spawning areas must be avoided.
- All activity must be conducted in such a manner that silt does not enter streams.
- Equipment must be mechanically sound to avoid leaks of oil, gas and/or hydraulic fluids.
- Crossings should be restricted to a single location.
- Fords should be constructed and used during the driest time of the year.

IMPLEMENTATION PROCEDURES

- Crossings should be at right angles to the stream.
- Approaches may be stabilized by using non-erodable materials, such as corduroy, brush mats, or clean stone materials.



MAINTENANCE

- The fording site should be monitored to ensure that the approaches to the site are not eroding. If erosion is taking place the appropriate corrective action should be taken.

ABANDONMENT

- When the fording site is no longer required, the stream channel and banks should be restored to their original condition. Any wheel ruts or other damage that may cause siltation in the stream must also be repaired to prevent silt from being discharged into the stream.

REFERENCES:

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

McCubbin, R.N. et al. 1990. (Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

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For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Forwarder Trails

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

Forwarder trails are utilized to transport timber to roadside. The mitigations outlined in this fact sheet can be used on all forwarding operations, and may be modified to work on skidding operations.

CONSIDERATIONS

- When the forest floor is compacted by machinery operating on trails, the natural filtering action of the soil is destroyed. Surface water is no longer absorbed, but is collected by wheel ruts which act as drainage ditches. As the water flows in these ruts, it erodes the soil and can discharge large volumes of silt into nearby streams, damaging fish habitat and aquatic life.

IMPLEMENTATION PROCEDURES

- The location of forwarder trails should be planned in advance to minimize the number of stream crossings.
- To ensure that sediment laden water does not collect in wheel ruts and discharge into streams, mudlogs should be installed across trails before ruts develop. The mudlogs should be installed close to where the water is entering the forwarder trail and the ground slopes to one side. A small earthen dam is pushed up with the forwarder blade on an angle across the trail, and a 30 cm (12 inch) diameter log is placed immediately in front of the dam, on the uphill side. If conditions are extremely wet, several of these may have to be placed along the trail.



Wheel ruts act as drainage ditches to transport sediment laden water.



Mudlogs deflect water off the forwarder trail and unto the forest floor.

- Where stream crossings are necessary, temporary bridges should be installed.



Portable bridges are economical, easy to install, and protect fish habitat.

MAINTENANCE

- If mudlogs become compacted into the ground and are no longer effective, new mudlogs should be installed along the trail.

ABANDONMENT

- Mudlogs should be maintained in place to ensure that surface water is intercepted and deflected into the surrounding vegetation.
- Approaches to stream crossings should be stabilized with slash.

- Temporary bridges can be removed to be used at the next harvesting site.
- These measures may also be employed on abandoned skidder trails.

REFERENCES

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada/N.S. Cooperation Agreement for Forestry Development. 34p.

McCubbin, R.N. et al. 1990. (Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

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For more information contact the nearest
Department of Fisheries and Oceans office.



Fisheries and Oceans
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FACTSHEET

Filter Fabric

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

This type of temporary barrier is commonly referred to as a silt fence or filter fabric dam. Its purpose is to prevent silt from entering waterbodies. These structures are not designed for long term control of siltation. Filter fabric should not be used in natural watercourse. It can be used in ditches and to surround a disturbed site to control site water runoff.

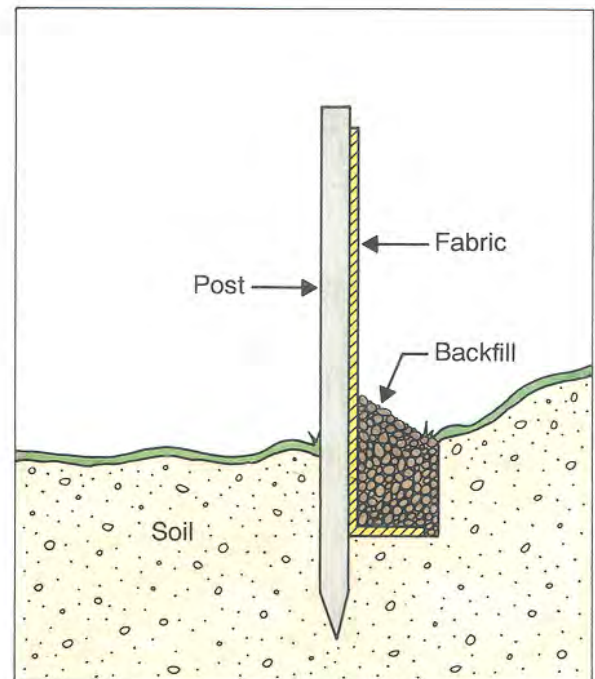
CONSIDERATIONS

- More than one filter fabric dam may be required.
- Filter fabric is designed for temporary use only.
- Further stabilization of disturbed areas may be required prior to filter fabric removal.

IMPLEMENTATION PROCEDURES

- For ditch installations filter fabric should be keyed in to the ditch bottom and sides a minimum of four inches.
- Keying in may be accomplished by excavating a minimum 4" x 4" trench in the ditch bottom and sides.

Wooden stakes should be installed a maximum of 1m apart on the downstream side of the trench and filter fabric attached to the upstream side of the stakes. The trench should then be backfilled. Installation for other disturbed areas should be similar with respect to trenching, stakes and backfilling.



MAINTENANCE

- Clean out accumulated silt at regular intervals as required and dispose of material so that it cannot subsequently run into any waterbodies containing fish.

- Repair or replace any damaged section(s) of fabric as well as any undercut or end flow areas where water flows freely around the filter fabric.

ABANDONMENT

- Filter fabric should not be removed until all site work has been completed and disturbed areas stabilized.
- Ensure all accumulated silt is removed and disposed of in an appropriate manner prior to removing fabric.
- All materials should be disposed of at an approved dumpsite.



Failure to key the dam into the ditch sides allowed water to wash around the dam.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.

FACTSHEET

Rock Check Dam

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Rock check dams can be used to prevent erosion and control siltation arising from roadside ditches.

CONSIDERATIONS

- These structures must never be used in natural watercourses.
- They can be constructed of locally available materials.
- Rock dams are relatively easy and economical to construct.
- If only larger stones are available, the dam should be lined with impermeable material.
- More than one dam may be necessary.

IMPLEMENTATION PROCEDURES

- Where drainage areas are larger and/or slopes are greater, 100 - 150 mm (4-6in) stones should be used to protect the back and sides of the dam.
- The center of the dam must be lower than the sides.

- The ends of the dam should be stabilized with rip-rap.



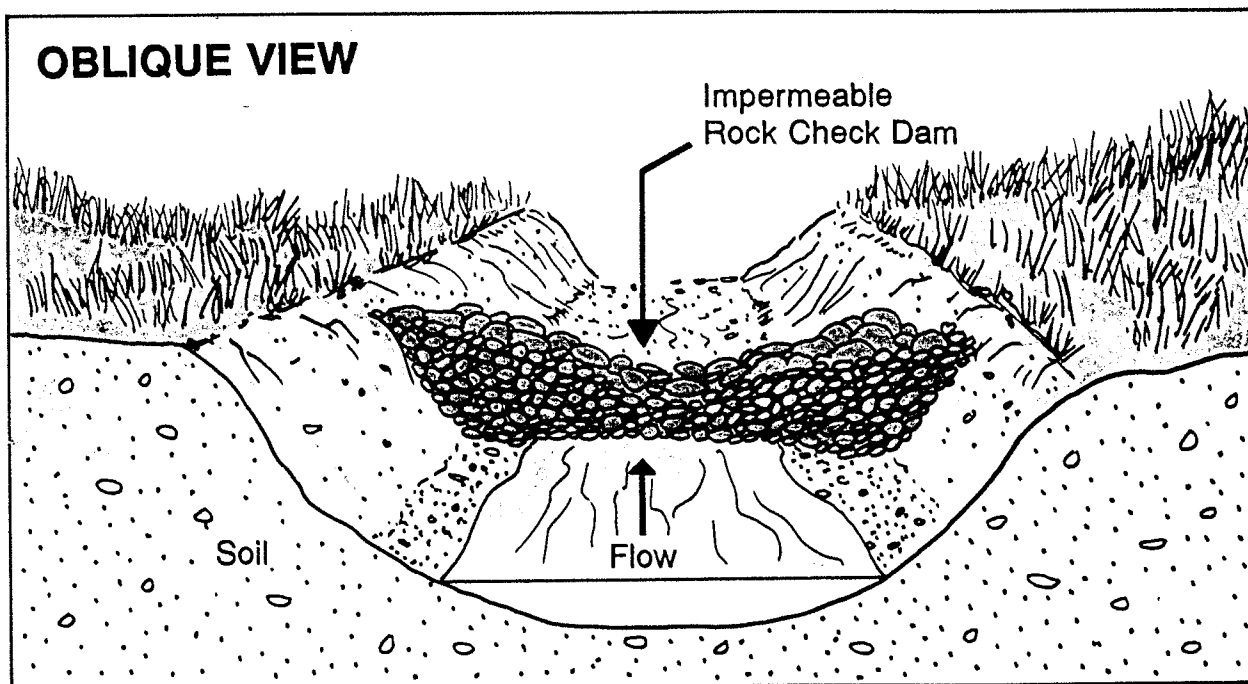
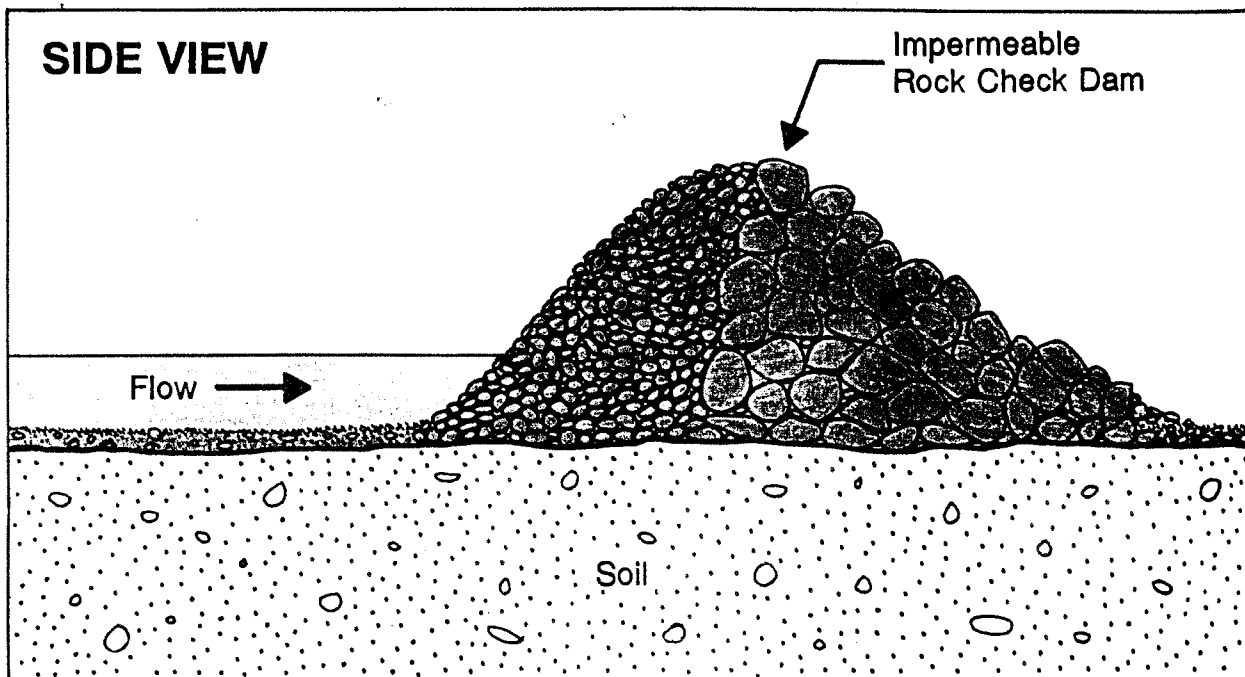
MAINTENANCE

- The dam should be regularly inspected, and accumulations of sediment removed.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

Rock Check Dam



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For more information contact the nearest
Department of Fisheries and Oceans office.



Fisheries and Oceans
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FACTSHEET

Temporary Bridges

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Temporary bridges are constructed to cross waterways on a short term basis, primarily for forestry and mineral exploration, where more permanent structures cannot be justified.

CONSIDERATIONS

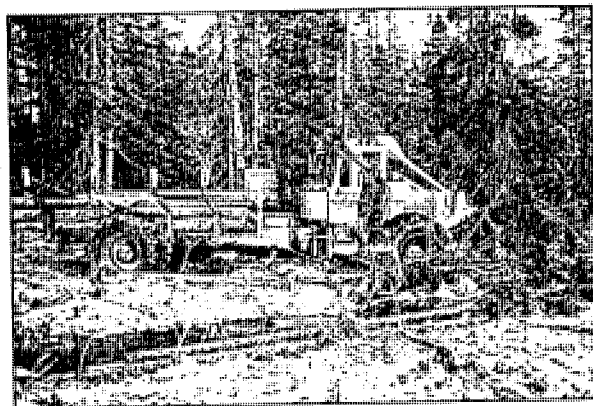
- Construction must be carried out in such a manner that silt does not enter the stream.
- The instream use of heavy equipment should be avoided.
- Bridges can be installed where the stream banks are stable and have low slope.

IMPLEMENTATION PROCEDURES

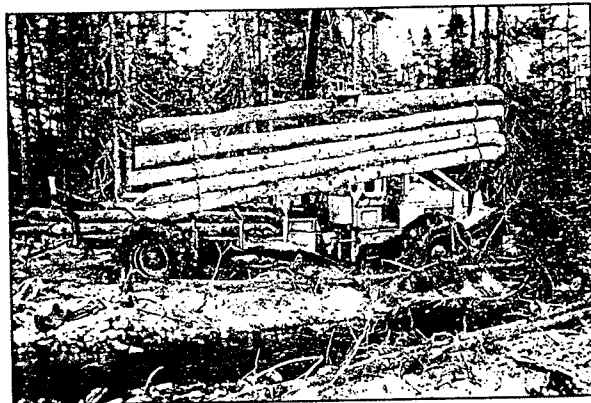
- Bridges are constructed of two sets of 5 meter long logs (3 - 5 in a set), and two bedlogs.
- The logs in each section are lashed together on the ends with chain.
- In preparation for the installation, some brush may have to be removed from the crossing site.

- A forwarder transports the bridge to the site, and installs the bridge by:

1. Placing the bedlogs on the stream banks, parallel to the stream.



2. Placing each section of the bridge.



3. Stabilizing the approaches with slash.



MAINTENANCE

- Approaches to the bridge should be maintained regularly by placing additional slash to prevent erosion.

ABANDONMENT

- When the bridge is no longer required, the bridge sections are removed. The bedlogs are maintained in place to prevent further disruption of the stream banks.
- When the structure is removed, wheel ruts and any other damage that may cause siltation in the stream should be repaired.

REFERENCES

- Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.
- Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada/N.S. Cooperation Agreement for Forestry Development. 34p.
- McCubbin, R.N. et al. 1990. (Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

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For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Resource Road Construction

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Resource access roads are constructed to provide access to forestry or mineral resources.

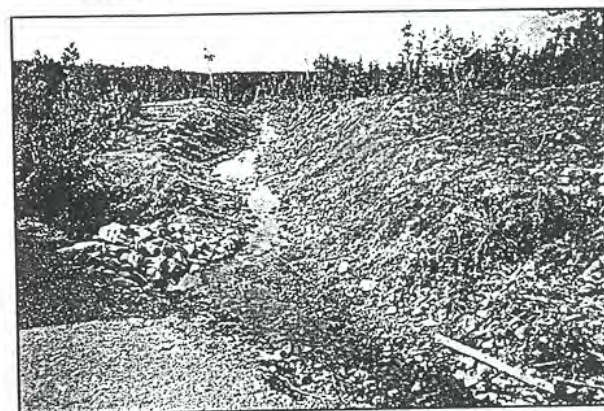
CONSIDERATIONS

- Resource roads should be located and built in an environmentally sound manner. The implications of such roads on fish habitat should be considered.
- The road layout should be planned such that the number of stream crossings is minimized.

IMPLEMENTATION PROCEDURES

- Where road construction takes place adjacent to a watercourse, a buffer zone of undisturbed vegetation should be maintained between the road and the stream.
- Aggregate materials for road building must not be removed from any stream.
- Side casting should be carried out in such a manner that sediment does not enter any stream.

- Roadside ditches should end blindly in vegetated areas, never directly into a stream.



- Right-of-ways should not be grubbed within 30 metres of stream crossings.
- Siltation control measures, such as sediment traps and check dams should be installed.

MAINTENANCE

The level of maintenance required for resource roads is dependent on the road's use at any given time.

- Regular inspections should be carried out to ensure that culverts and take-off ditches are maintaining proper drainage.
- Roads should be graded and properly crowned to shed water.

Resource Road Construction

- Sediment control measures should receive regular maintenance.

removed when the road is abandoned. Permanent maintenance free structures should be left in place.

ABANDONMENT

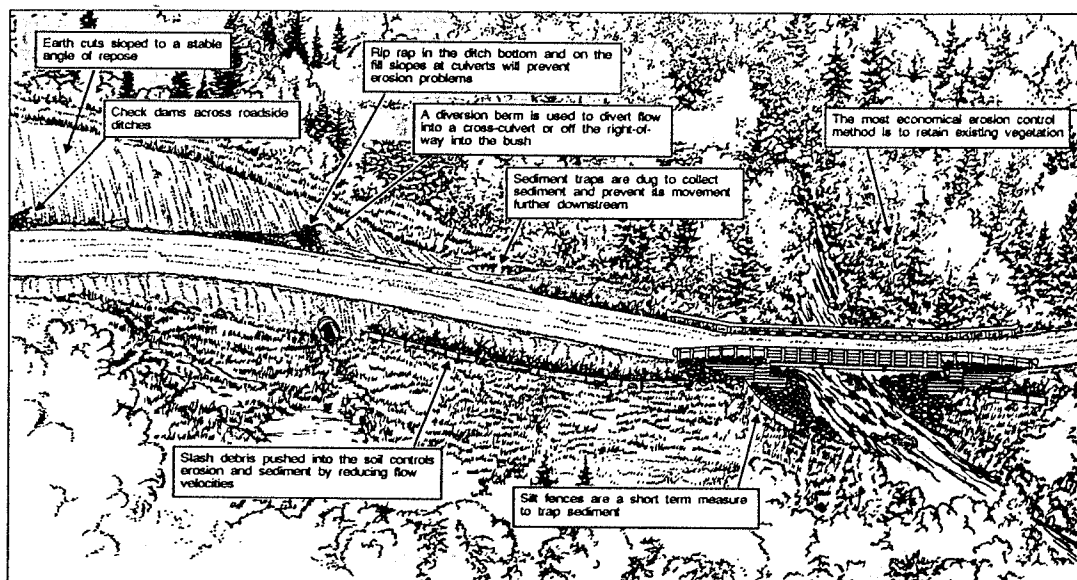
- Consideration should be given to regeneration of the road right-of-way to make the area productive for growing trees and to prevent erosion.
- Surface erosion can be controlled with water bars or transverse ditches excavated across the road surface. These ditches intercept surface runoff and deflect it off the road surface and into the surrounding vegetation.
- Bridges and culverts that require ongoing maintenance should be

REFERENCES

Anon. 1990. Environmental Guidelines for Access Road Construction and Water Crossings. Ontario Ministry of Natural Resources. 64p.

Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada/N.S. Cooperation Agreement for Forestry Development. 34p.

McCubbin, R.N. et. al. 1990. (Revised) Resource Roads Construction - Fish Habitat Protection Guidelines. DFO. 78p.



This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Instream Work in the Dry Cofferdams

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

A cofferdam usually consists of a double row of sand bags with plastic placed between the rows. They are used to isolate stream sections from stream flow to carry out work under dry conditions. Cofferdams can be used alone (for example to isolate work areas along stream margins from stream flow) or in conjunction with pumps to conduct work(s) within stream channels. If possible, cofferdams should only be used in streams during periods when streamflow is low.

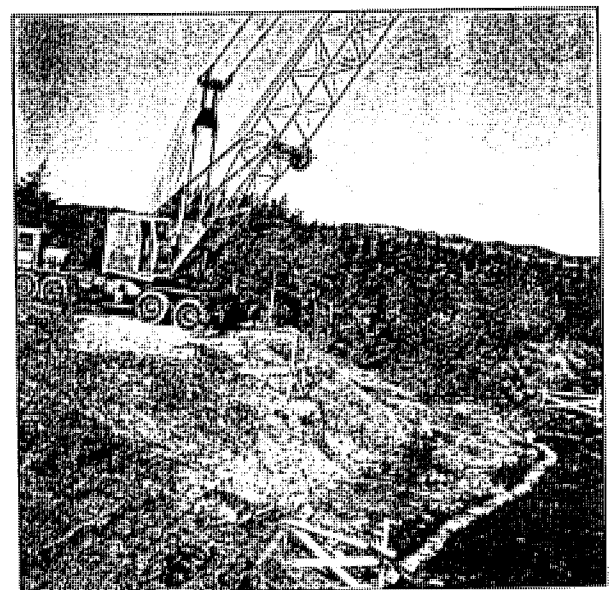
day their operation should be monitored during periods when no work is occurring at worksites.



Instream work in the dry using cofferdams.

CONSIDERATIONS

- Cofferdams sometimes leak, allowing water to enter work areas. In these circumstances the use of a pump to remove silted water contained within cofferdams is necessary to prevent siltation of downstream areas.
- Cofferdams should be sufficiently high to prevent overtopping in the event of sudden increases in water levels.
- Cofferdams should be removed from streams when no longer required.
- If pumps are used to route streams around cofferdams for more than one



Cofferdam isolating stream margin work area from stream flow.

IMPLEMENTATION PROCEDURES

- In cases where it is necessary to carry out work within a stream channel a cofferdam should be first placed into the stream at or above the upstream limit of the work area. A pump should be placed upstream of this cofferdam to pump streamflow around the work area and back into the stream. A second cofferdam can then be placed into the stream at or below the downstream limit of the work area, thereby isolating the work area from streamflow and permitting work to be carried out in the dry.
- In order to prevent silt from entering the stream a second pump is used to remove silted water from the work area inside the cofferdams. This silted water should be treated by discharging to settling basins, vegetated areas or sediment traps prior to release to streams.

MAINTENANCE

- Sand bags damaged during the course of a work should be replaced.
- Care should be taken to seal leaks in cofferdams.

ABANDONMENT

- Cofferdams should not be removed from streams until instream work areas have been fully stabilized.
- All cofferdam materials should be removed from the stream and disposed of at an approved dump area.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Streambank Stabilization

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Streambank stabilization is appropriate where:

- An area of streambank is undergoing "natural" erosion and causing deposition of sediments in spawning and rearing habitat downstream.
- An area of streambank has been disrupted or destroyed during the conduct of a work or undertaking and the area in question requires "rebuilding".

CONSIDERATIONS

- Rip rap, the usual material type employed for riverbank stabilization, should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events.
- Stream banks to be stabilized or rebuilt should be shaped so that they are at a stable slope.
- Gabion baskets can be used as an alternative to rip rap where bank slopes are not at a stable angle of repose.
- Streambank stabilization should not result in a decrease in the cross sectional width of streams.



Stream bank stabilization using rip rap and hydroseed.



Rebuilt stream banks - rip rap, sod and natural vegetation.

IMPLEMENTATION PROCEDURES

- Rip rap or gabion basket placement should be carried out in the dry (e.g. using cofferdams consisting of double walls of sand bags with plastic placed between the walls to isolate streambank areas from streamflow)
The planting of trees (e.g. alders, willows) and other vegetation (for example grass, small shrubs, etc.) on streambanks can enhance stabilization measures.
- Stabilization materials used should be placed from the toe of the bank slope to a height on the streambanks equal to the anticipated high water level or to the top of the bank slope, as appropriate.
- The effectiveness of streambank stabilization can be increased if the top of bank slopes are seeded, sodded, or hydroseeded in conjunction with the placement of rock, rip rap, or gabions.
- In river sections where the stream channel meanders particular care should be exercised in stabilizing the outside bends of meanders since such areas are subject to increased erosion pressures.

MAINTENANCE

- Once stream banks have been properly restored maintenance is not often required.

ABANDONMENT

- Excess materials left over from stream bank rehabilitation and cofferdam materials, etc. should be disposed of at an approved dump site.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Instream Work in the Dry Temporary Diversion

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

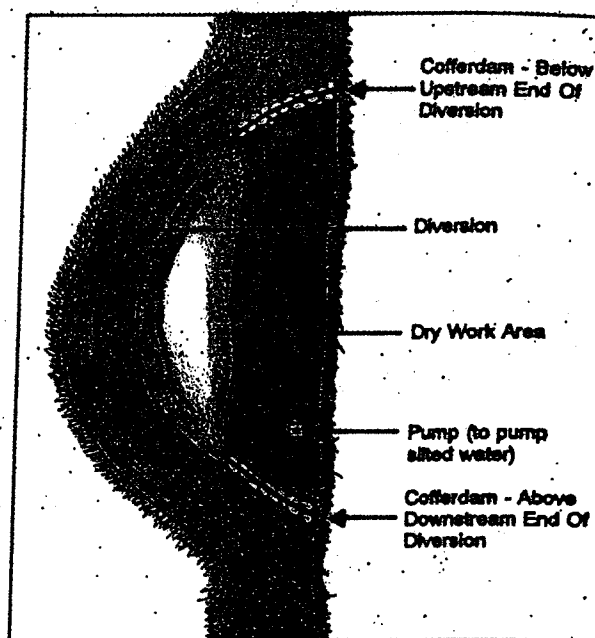
A temporary diversion is used to conduct instream work in the dry. This method is usually limited only by the availability of space within which to construct a diversion.

CONSIDERATIONS

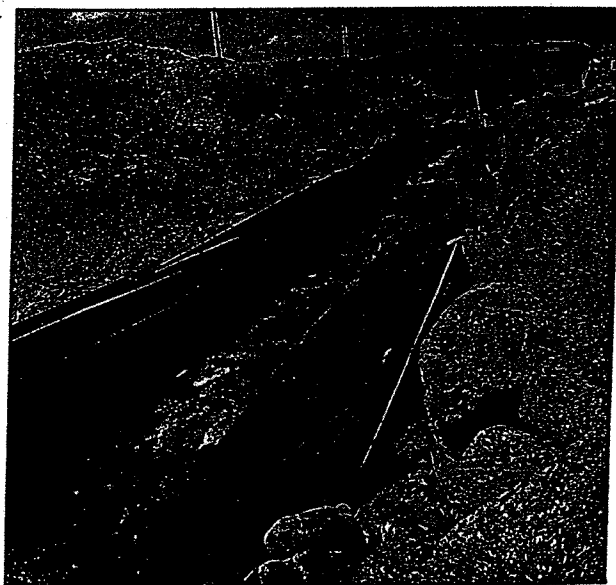
- Constant maintenance of diversion channels may be required.
- Care must be exercised in the excavation of the diversion channel to ensure that it is capable of accommodating peak flows from the stream which is being diverted.
- A pump is usually required to remove silted site water arising in dewatered work areas.

IMPLEMENTATION PROCEDURES

- Temporary diversions should be excavated from the downstream end toward the upstream point of diversion, where a "plug" of earth should be left to prevent the entry of streamflow into the diversion channel before it is stabilized. Strong plastic sheathing can be used to line the channel bottom and slopes. This sheathing should be weighted down with crushed stone and staked into the top of the channel slopes. Once



Temporary diversion.



Temporary diversion - channel liner.

Instream Work in the Dry - Temporary Diversion

the channel has been lined and the lining secured, the "plug" of earth referred to earlier can be removed.

- A cofferdam (recommended double walls of sand bags with plastic placed between the walls) should then be placed immediately below the upstream point of diversion to re-route the flow of water into the diversion. Another cofferdam should then be placed immediately above the downstream point of diversion to isolate the work area and prevent silted water from escaping into the stream. In this manner the work area is effectively isolated from the stream and instream work can proceed in the dry. Silted water arising within the work area should be treated by discharging to vegetated areas, sediment traps or settling basins.

- At increased water levels and velocities it may be necessary to further secure the channel liner.

ABANDONMENT

- The diversion should be filled in and stabilized when no longer in use.

MAINTENANCE

- Plastic used to line the diversion must be kept in a good state of repair.
- Care must be exercised to ensure that streamflow does not get under or behind the channel liner and cause erosion of the channel banks and subsequent downstream siltation.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Instream Work in the Dry Elevated Pipes

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

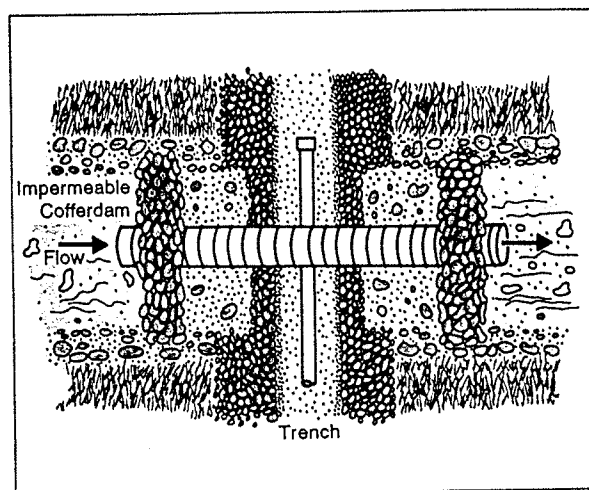
This method can be used to carry out instream work in the dry as an alternative to the use of cofferdams (and pumps) or in circumstances where site constraints preclude the construction of a temporary diversion. The use of elevated pipes should be restricted to times of year when streamflows are low and fish species are not undergoing spawning migrations (elevated pipes can impede the migration of fish).

CONSIDERATIONS

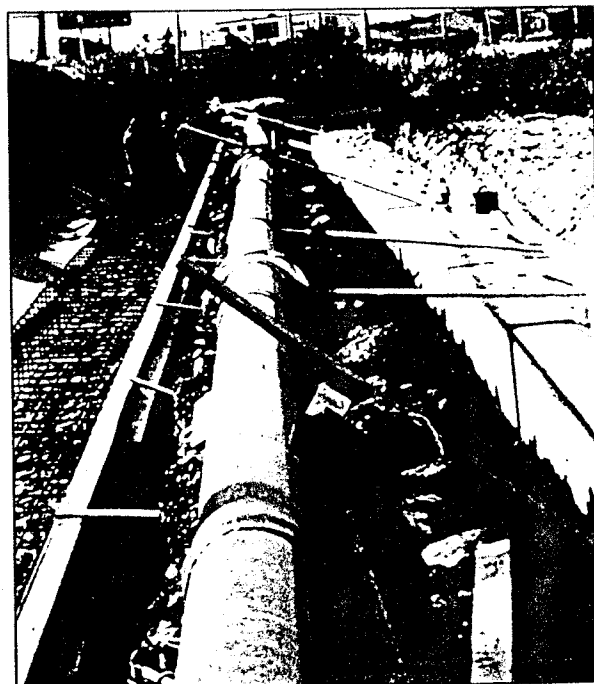
- It will usually be necessary to have completed instream work and have elevated pipes removed prior to migration periods.
- Elevated pipes should be of a size capable of accommodating sudden increases in streamflow to prevent flooding of work sites.
- It may be necessary to pump streamflow around work sites in cases where the capacity of elevated pipes is exceeded and flooding of work sites is imminent.

IMPLEMENTATION PROCEDURES

- The inlet and outlet of an elevated pipe is usually seated on cofferdams (e.g. double walls of sandbags with



Stream crossing dewatered by means of an elevated pipe.



Elevated pipe.

plastic placed between the walls). Upstream and downstream cofferdams should be placed into the stream and the pipe placed onto the cofferdams. Additional sandbags should then be placed on top of the pipe inlet and outlet to hold it in place. If more than one pipe section is necessary to carry streamflow over the instream work area then consideration should be given to the impermeability of the area(s) where the pipe sections are coupled.

MAINTENANCE

- Cofferdams should be checked periodically to ensure that water is not leaking through them and into the work area or from the work area into the stream. Any such leaks should be repaired as soon as possible.

ABANDONMENT

- The instream work area should be fully stabilized and brought back to grade prior to removing the elevated pipe.
- Sand bags, pipe sections, etc. should be removed upon project completion.

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For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Culvert Stabilization

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

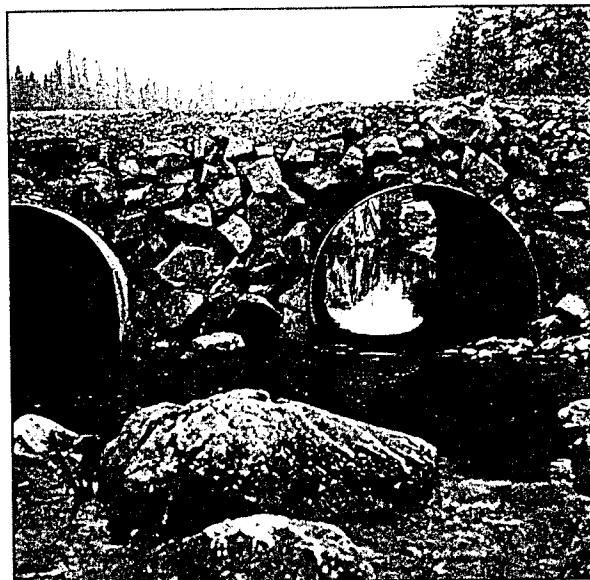
Stabilization of culvert inlets and outlets should be undertaken when culverts are installed. This prevents the erosion of materials from around culverts and subsequent downstream siltation and possible loss of the culverts due to washouts.

CONSIDERATIONS

- Materials used for stabilization purposes should be clean and non erodible (e.g. blasted rock, or rip rap, or gabion baskets).
- Materials used for stabilization should completely cover unstabilized materials (e.g. road fill, gravel) at culvert inlets and outlets.
- Fill slopes should be stable to ensure that roadbed materials do not enter watercourses.

IMPLEMENTATION PROCEDURES

- When a culvert has been installed gabions, rip rap, or large, clean rock should be placed at the culvert inlets and outlets. All materials used for stabilization should be of sufficient size to prevent erosion under anticipated operating levels for the culvert.



Culvert rip rap stabilization.



Stabilization of culvert outlets - rip rap.

MAINTENANCE

- Culverts should be inspected regularly to assess the adequacy of stabilization measures. Areas from which stabilization materials have become dislodged should be repaired.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Storm Drain Outlets

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

Storm drain outlets are used to conduct storm water away from developed lots, buildings, housing developments, etc. and usually discharge into the nearest stream.

channel should be fully stabilized prior to the entry of storm water into it to prevent erosion and consequent downstream siltation.

CONSIDERATIONS

- Storm drainage channels should be of a size capable of accommodating peak storm events.
- Storm drainage outlet structures should not be constructed directly on stream banks, but should be constructed some distance back and a channel excavated from the outlet structure to the stream.

IMPLEMENTATION PROCEDURES

- Storm drain outlet structures should be constructed after excavating a channel to the stream; this channel should be constructed so that it is generally oriented parallel to the direction of flow of the receiving stream. This channel should be lined with clean stones to reduce the velocity of water exiting the outlet structure before the water enters the stream in order to avoid streambed and stream bank erosion. The



Storm drain outlet - orientation to stream-flow.



Storm drain outlet channel - stabilization.

MAINTENANCE

- Once storm drain outlets have been properly constructed and stabilized regular maintenance is usually not required.

ABANDONMENT

- All excess materials resulting from excavation of the storm drainage channel and construction of the storm water outlet structure should be removed and disposed of at an approved site.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required.
The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Highway Construction Low Point Protection

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

Low point protection is advisable where a stream or drainage into a watercourse on a highway construction project is situated so that it receives sediment bearing drainage from disturbed areas uphill on both sides of the low point.

CONSIDERATIONS

- If filter fabric is used for low point protection it should be installed properly to maximize its efficiency.
- Ditch blocks consisting of materials such as crushed stone, brush, etc. can be used in place of filter fabric and require much less maintenance.
- A series of siltation control structures is recommended for the proper treatment of sediment bearing water.
- Ditch blocks, etc. are temporary measures put in place until drainage ditches and associated disturbed areas have been fully stabilized; such areas should be stabilized as soon as possible after having been disturbed and normally within the same construction season.



Highway low point (centre).



Filter fabric used for low point protection.



Ditch block (rock dam) used for low point protection.

IMPLEMENTATION PROCEDURES

- If drainage ditches are being excavated from disturbed areas toward the low point, siltation control structures (e.g., ditch blocks, etc.) should be installed before the ditch terminates some distance from the low point, preferably in a vegetated area. Where road ditches already exist, siltation control devices should be installed before the commencement of construction activities.

MAINTENANCE

- If filter fabric dams are used to protect low points from siltation, these filter fabric dams should be maintained in good operating condition.
- It will be necessary to remove sediment accumulated behind ditch blocks periodically.

ABANDONMENT

- Ditches and adjacent disturbed areas should be stabilized as soon as possible after they have been excavated/disturbed, normally within the same construction season.
- Filter fabrics, if used, should be removed and disposed of at an approved site when no longer required.

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For more information contact the nearest
Department of Fisheries and Oceans office.



FACTSHEET

Temporary Settling Basins (Detention)

Department of Fisheries and Oceans • Newfoundland Region

CONDITIONS WHERE APPLICABLE

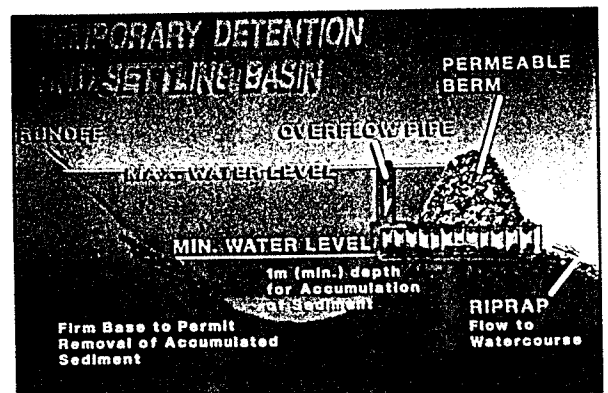
These basins are used (on a relatively short term basis) for the treatment of silted water prior to release to water-courses.

CONSIDERATIONS

- These basins are often most effective when they are constructed so that their length is four times their width.
- The bottoms of settling basins should be lined (e.g. with plastic).
- Settling basins are often most effective when several are used in series.

IMPLEMENTATION PROCEDURES

- A pipe should be installed near the top of a settling basin in such a manner that it discharges water from the top of the water column. There are a number of alternatives to this method of settling basin construction involving the use of various detention devices such as pre-cast manholes, and utilizing natural topographic features.



Settling basin construction details.



Settling basin lined with plastic.

MAINTENANCE

- It may be necessary to remove and dispose of accumulated sediment from settling basins in order to maintain their operating capacity.

ABANDONMENT

- Settling basins should be filled in and stabilized when no longer required.



Series of rough settling basins intended for short term use.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Bridge Construction

Department of Fisheries

CONDITIONS WHERE APPLICABLE

The construction of permanent bridge structures is the preferred method for stream crossings, especially for crossings of large streams or rivers. Demolition of old existing bridges in sensitive areas should be carried out so as to minimize impacts on fish and fish habitat.

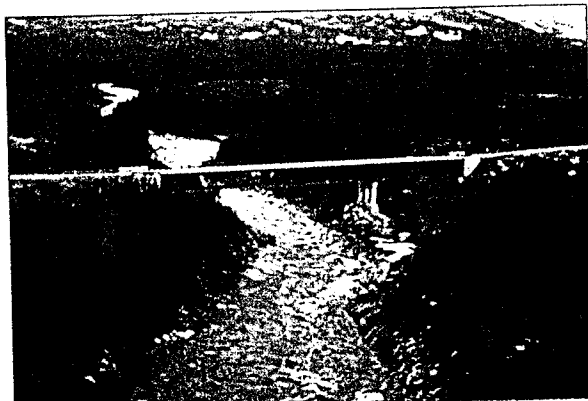
CONSIDERATIONS

- All instream works should be carried out in the dry (see Factsheets # 10, 12, and 13 regarding mitigations for instream work in the dry) and in such a manner that no silt enters watercourses / waterbodies (see Factsheets # 6, 7, 10, and 17 regarding measures to control siltation).

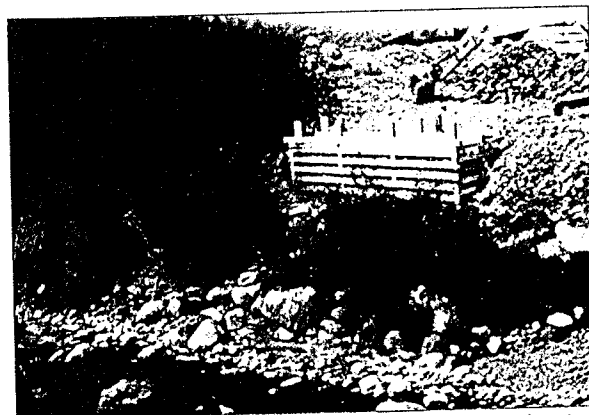
IMPLEMENTATION PROCEDURES

Construction

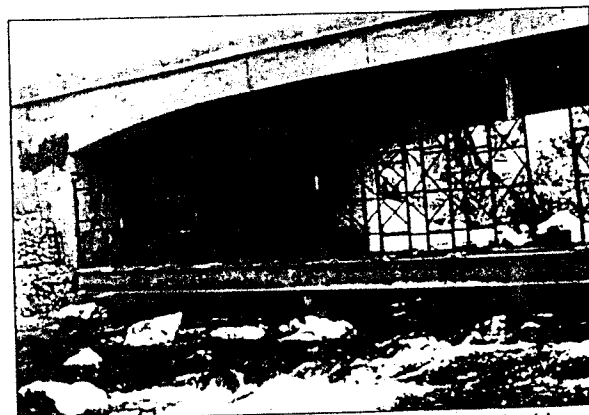
- Bridges should be constructed at right angles to waterways and on straight stretches of watercourses.
- Bridge abutments should be located outside the normal wetted stream perimeter.
- Gabions, or wing walls, should be used to prevent the erosion of road/road shoulder materials into watercourses.
- "False Work," if used to support concrete bridge decking while the



Bridge construction.



Bridge abutments outside wetted stream perimeter.



"False Work" to support concrete bridge decking.

decking "cures," should allow for fish passage at all times.

- Every precaution is to be taken to prevent the entry into watercourses/ waterbodies of chemicals, such as lime and cement, which could be very toxic to aquatic life.

MAINTENANCE

- Routine abutment and deck maintenance is usually required where bridges have been properly constructed. Standard procedures to protect fish and fish habitat should be followed.

DEMOLITION

- Where it becomes necessary to demolish or remove a bridge every effort should be made to avoid "dropping the bridge" into rivers/ streams. This could be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections.
- Where the only alternative is "dropping" a bridge into a river, and depending upon the fish habitat in the affected area, it may be necessary to construct a platform onto which the bridge could be dropped.

- If a new bridge is not to be constructed in the area, as much as possible of the abutments and wing walls should be left in place in order to prevent the slippage of unstable materials into watercourses. Failing this, unstable materials on both sides of the bridge approaches should be removed prior to abutment removal, and the disturbed areas stabilized to prevent erosion. (See Factsheet # 11 regarding streambank stabilization.)

ABANDONMENT

- All excess materials should be removed and disposed of at an approved dump site.

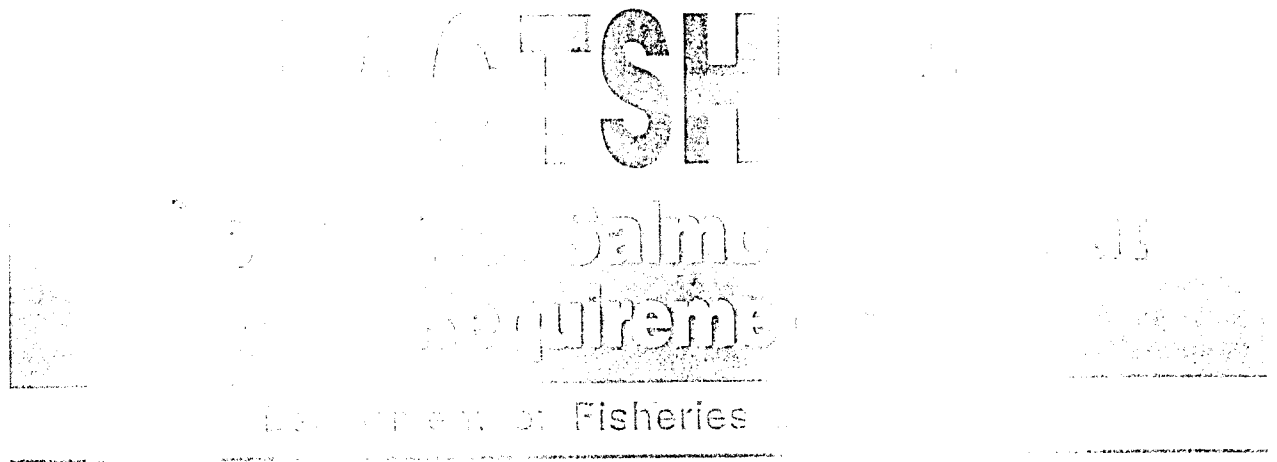
This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
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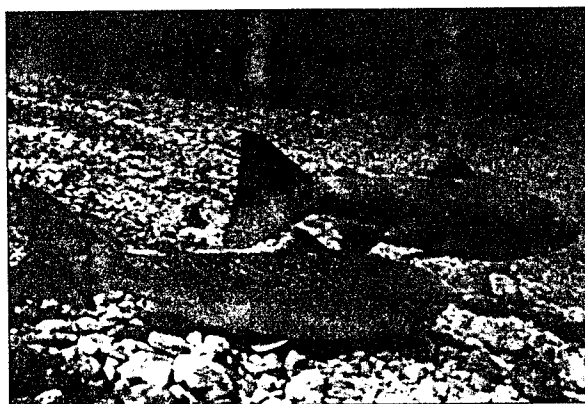


CONDITIONS WHERE APPLICABLE

Fish habitat is defined as those parts of the environment on which fish depend, directly or indirectly, in order to carry out their life processes. This includes spawning grounds, rearing habitat, migration and feeding areas.

SPAWNING AREAS

Salmonids require a stretch of stream with clean gravel and good water flow. This type of habitat is most often found in headwater areas (the uppermost stream reaches), where there is typically finer substrates and relatively stable water flows. However, salmonids also spawn in the lower reaches of streams. For successful spawning, salmonids require clean, stable gravel of 1 cm to 15 cm in diameter depending on fish size. These stream conditions provide a stable supply of clean, cool, well oxygenated water for the successful incubation of eggs deposited in the gravels, and rearing of young.



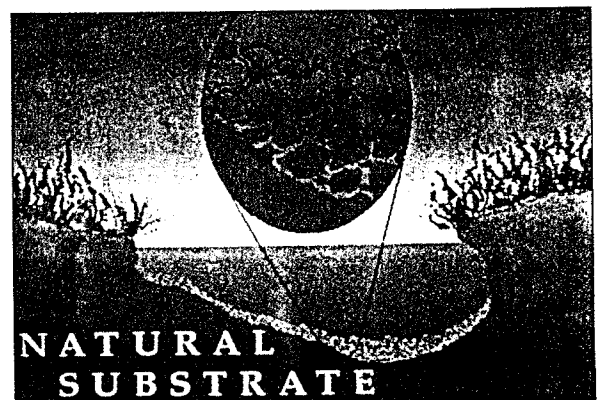
Spawning habitat.

REARING AREAS

Rearing habitat varies from areas of low stream velocity and small substrate to areas of larger (cobble/boulder) substrate and higher velocities. Streams supporting successful salmonid populations are usually associated with a high proportion of riffles and pools, thus offering a variety of habitat cover types. Shelter is provided by undercut banks, deep pools, turbulence, rocky areas, instream debris, and overhanging (riparian) vegetation.

MIGRATION AREAS

Migration areas consist of stream reaches that provide corridors for fish movement from one area of the watershed to another or, for anadromous (sea-run) salmonids, access to and from the sea. Migration areas must permit fish movement to critical habitats. The lack of barriers to migration in the main stream and tributaries, as well as adequate water flow are essential.



Spawning gravels.

FEEDING AREAS

Insect life is the major food supply for salmonids. The available food supply of a stream depends on clean, cool, well oxygenated water flowing over a clean bottom of gravel, cobble or boulders.

Salmonids are primarily sight feeders and water clarity influences feeding ability. Streams must be clear enough to permit sunlight to penetrate and permit adequate algal growth which, in turn, maintain a healthy aquatic insect population as a food supply for fish. Beneath the surface of a stream, among the rocks and boulders, there is an abundance of insects in their immature forms. A variety of stream bottom materials is required for production of aquatic insects. Insects falling into the stream from overhanging vegetation also provide food for salmonids.

Optimum fish production is contingent upon a combination of a variety of conditions, including adequate food supply, suitable dissolved oxygen levels, cool stream temperatures, shelter (cover), and clear, clean water.

The above factors combine to make salmon and trout very sensitive to various environmental changes. These factors are all necessary to support a productive salmonid population. Loss of any one of these critical habitat components usually results in severe reductions or total loss of salmonid stocks from a given area.



Riffle area containing rearing, spawning and feeding habitat.

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For more information contact the nearest
Department of Fisheries and Oceans office.



Fisheries and Oceans
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FACTSHEET

Highway Construction / Upgrading Infilling, Stabilization & No-grub Zones

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

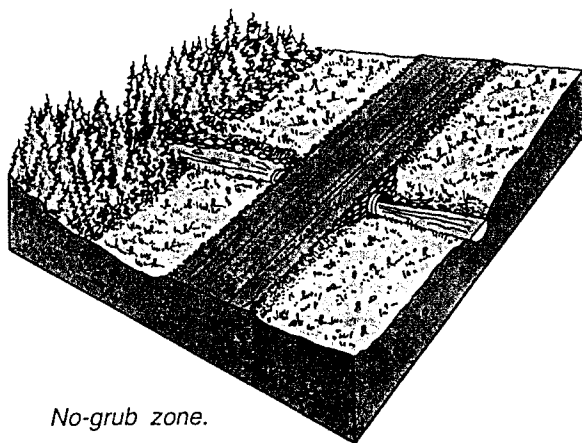
The following mitigation options are recommended wherever highways are being constructed or upgraded across watercourses and across or through small ponds.

CONSIDERATIONS

- Construction/upgrading should be carried out in such a manner that silt does not enter watercourses/waterbodies (see Factsheets # 6, 7, 10 and 17 regarding measures to control siltation).
- Instream works associated with highway construction/upgrading should be carried out in the dry (see Factsheets # 10, 12 and 13 regarding instream work in the dry).

IMPLEMENTATION PROCEDURES

- A no-grub buffer zone (recommend 30 metres) should be maintained adjacent to all watercourses in



No-grub zone.

crossing areas; there should be no grubbing within this zone except for road approaches. Grubbing for road approaches should only be done immediately prior to subgrade construction.

- Where infilling of small gullies or small ponds cannot be avoided by adjusting road alignments, then such waterbodies should be isolated from streamflow (recommend using cofferdams and pumps - see Factsheet # 10). Water can be pumped from these waterbodies until they are dry. In situations where only a portion of a waterbody is to be infilled, attempts should be made to isolate the infill area from the rest of that waterbody while infilling is ongoing (e.g., geotextile materials, plastic, rock berms, etc.).
- Only clean, non-erodible materials should be used for infilling waterbodies (e.g., blasted rock containing no, or a minimum of, fines).
- Stabilization of stream crossing areas should be carried out as soon as possible after the crossing structure has been installed and certainly within the same construction season (see Factsheet # 11 regarding stream bank stabilization).
- Disturbed areas along highway right-of-ways, which could lead to ongoing siltation to watercourses/waterbodies, should be stabilized or re-vegetated as soon as possible after they have been disturbed and

Highway Construction / Upgrading

certainly within the same construction season.



Stabilization.

- It is recommended that DFO be contacted prior to the onset of construction/upgrading regarding appropriate approvals of works or undertakings which may impact on fish and fish habitat.

MAINTENANCE

- Stabilization failures at stream crossing areas or along right-of-ways should be re-stabilized as quickly as possible.

ABANDONMENT

- Once construction has been completed and before contractors abandon construction sites all excess materials should be removed so as not to enter adjacent watercourses/waterbodies.

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For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Freshwater Intake End-Of-Pipe Fish Screen

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Fish protection should be provided for activities involving extraction of fresh water. An intake should be screened to prevent potential losses of fish due to entrainment or impingement. Entrainment occurs when an organism is drawn into a water intake and cannot escape. Impingement occurs when an entrapped organism is held in contact with the intake screen and is unable to free itself.

CONSIDERATIONS

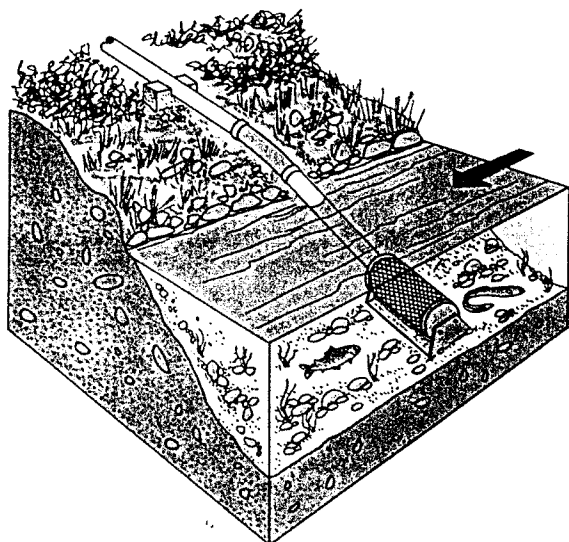
- For small permanent and temporary freshwater withdrawals up to 125 litres/second (L/s) (2000 US gallons per minute (gpm)), associated with irrigation, construction, small municipal and private water supplies, etc., end-of-pipe intake screen designs are often used for the protection of fish.
- Open screen area requirements for freshwater intake end-of-pipe fish screens differ depending upon swimming mode (i.e., subcarangiform - fish that swim like trout/salmon; or anguilliform - fish that swim like an eel).
- Freshwater fish of 25 mm (i.e., fry stage) or more in length should be protected from entrainment and impingement due to water extraction activities, unless site-specific circumstances, as addressed with DFO, indicate otherwise.

IMPLEMENTATION PROCEDURES

- The required screen area (i.e., the area of all open spaces on the screen available for the free flow of water) varies depending upon rate of water withdrawal. The narrowest dimension of any opening on the screen, regardless of opening shape, for fish of 25 mm is estimated at 2.54 mm. DFO should be contacted regarding specific requirements.
- Screen openings may be round, square, rectangular, or any combination thereof, and should not have any protrusions that could injure fish.
- Where possible, screens should be located in areas and depths of water with low concentrations of fish throughout the year, away from natural or constructed structures which may attract fish that are migrating/spawning or in rearing habitat, and at a minimum of 300 mm above the bottom of the watercourse/waterbody to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- The screen face should be oriented in the same direction as the flow.
- Flow should be evenly distributed over the screen surface.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially in areas of debris movement.

Freshwater Intake End-Of-Pipe Fish Screen

- DFO should be contacted regarding proposed water withdrawal activities prior to start-up.



MAINTENANCE

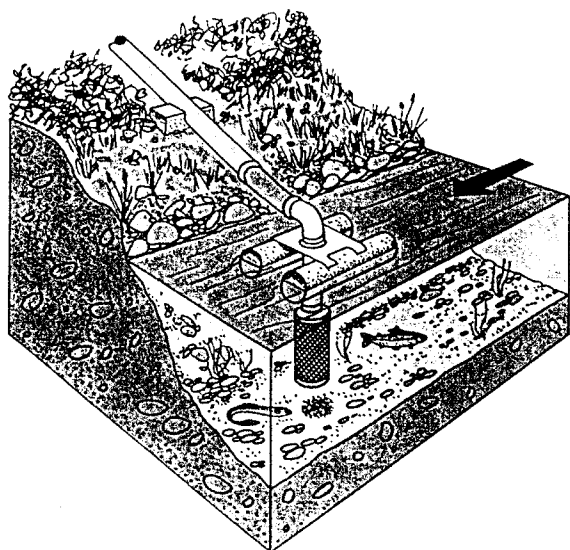
- Regular maintenance should be provided, including the removal, inspection, and cleaning of screens to prevent debris fouling and impingement of fish.
- Pumps should be shutdown when fish screens are removed for inspection and cleaning.

ABANDONMENT

- Consideration should be given to the removal of the intake screen and associated infrastructure.

For more specific technical information refer to:

Department of Fisheries and Oceans. 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline. Communications Directorate, Department of Fisheries and Oceans.



Examples of typical applications and features of end-of-pipe screens.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Diamond Drilling Exploration

Department of Fisheries and Aquaculture

CONDITIONS WHERE APPLICABLE

The following mitigations are recommended for activities associated with exploratory mineral drilling operations (e.g., access roads, trenching, etc.), which could impact on fish and fish habitat if not carefully planned.

CONSIDERATIONS

- Water lines and access routes to drill sites should be located in areas which will create the least amount of disturbance to fish and fish habitat.
- Careful planning should be undertaken to minimize the length and number of access roads/trails and stream crossing sites in order to reduce potential erosion problems. (See Factsheets # 4 and 9 for information pertaining to resource roads and fording sites). This could also simplify site restoration when an area is abandoned. Stream crossing sites should be discussed with DFO.

IMPLEMENTATION PROCEDURES

- If clearing and levelling are required, disturbed areas should be no larger than absolutely necessary.
- It is recommended that buffer zones of $12\text{ m} + 1.5 \times \text{slope } (\%)$ be maintained adjacent to all watercourses for access roads.
- Buffer zones of 30 m are recommended for grubbing and clearing zones.
- Campsites should not be located within 100 m of any waterbody/watercourse.
- If trenches are to be left open for a period of time, excavated material should be contoured and stabilized to prevent erosion and silt entering waterbodies. Trenches and ditches



Disturbed areas larger than necessary.



Poorly constructed access road.

should not be drained directly into a waterbody/watercourse. (See Factsheets #6, 7, 10 and 17 regarding measures to control siltation).

- Screens are recommended for a water withdrawal intake in fish bearing waters. (See Factsheet # 21 for information regarding freshwater intake end-of-pipe fish screens).
- Drilling wastes should not be allowed to enter waterbodies. Adequate closed circuit facilities should be provided for drilling mud and flocculating agents.



Debris/waste should be removed upon project completion.

- All fuel and hazardous materials present on site must be handled with care in order to minimize spills. Fuel should be properly stored a minimum of 100 m from any waterbodies/watercourses.
- If drilling is undertaken through a

ice covered watercourse/waterbody only sufficient fuel for one refuelling should be brought on the ice at any one time. In addition, when the drill site is abandoned all debris which is frozen into the ice/snow should be removed and discarded in an approved disposal site.

- Contingency plans should be in place to deal with any environmental emergency.
- All maintenance of drill rigs and other equipment, other than emergency repairs, should be carried out on land at least 100 m from the nearest waterbody/watercourse.

ABANDONMENT

- Upon termination of exploratory/drilling operations, all fuel or hazardous materials are to be removed from the area, the site resloped and revegetated if natural revegetation appears unlikely.
- All wastes shall be collected, transported and disposed of at an approved disposal site.
- When backfilling trenches, the material should be replaced in the order it was removed. After backfilling and compaction is completed, the surface should be stabilized. If natural regeneration is unlikely, the site should be revegetated.

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For more information contact the nearest
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FACTSHEET

Stream Clean-up

Department of Fisheries and Aquaculture

CONDITIONS WHERE APPLICABLE

Stream clean-up is sometimes required in streams that have had man made materials introduced into them from various activities/sources. These materials could cause the following problems:

- obstructions to fish migration
- scouring of the natural stream bottom sometimes removing spawning gravels or causing siltation of spawning gravels downstream
- alteration of the natural flow of a stream resulting in streambank erosion or excessive water velocities preventing fish migration
- filling in of the natural bottom substrate resulting in the loss of access to suitable fish spawning/rearing habitat.



Instream barriers to fish migration.

CONSIDERATIONS

- Trees, bushes, shrubs, weeds or tall grasses should not be removed along

any streambank. In addition, mats of floating algae or vegetation should not be removed from any section of the stream. These important habitat features provide shade and cover for fish, keeping water temperatures cool, providing insect food for fish and offering protection from predators.

- Woody debris which is not causing any apparent damage to the bottom substrate may be left in place as it provides cover for fish. As woody debris decomposes it becomes a food source for small microorganisms and invertebrates which, in turn, are eaten by trout and young salmon. Decomposition also renews the energy cycle with nutrients.



Overhanging vegetation should not be removed.

- Activities associated with stream clean-up must not alter the flow characteristics of the stream as this may cause streambank erosion, bottom scouring and possible downstream deposition of sediments.

In addition, increased water velocities may act as a barrier to fish migration.

- Streambanks must not be disturbed such that underlying soils are exposed. This could cause silt to enter the stream resulting in a loss of fish habitat. Any streambank that is disturbed should be immediately stabilized by re-vegetating. (See Factsheet # 11 regarding streambank stabilization).

IMPLEMENTATION PROCEDURES

- Instream activity should be scheduled to take place between June 1 and September 30, in order to reduce impacts to fish habitat during fish spawning and incubation periods.
- Instream debris should be removed by hand. Heavy equipment should not be used instream.

- All necessary measures must be taken to avoid the release of silt into the stream. (See Factsheets # 6, 7, 10 and 17 regarding measures to control silt).
- The natural stream bottom substrate must not be altered or disturbed in any way.
- Instream clean-up activities should be carried out during times of low flow.
- All surplus or waste material should be removed from the project area and disposed of at an approved dump-site.
- DFO should be consulted regarding any stream clean-up project prior to start-up.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Timber Crib

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Timber cribs are utilized as a component of marine infrastructure (wharves, slipways, sea walls, etc.) and sometimes as erosion control structures in inland waterways (i.e., abutments).

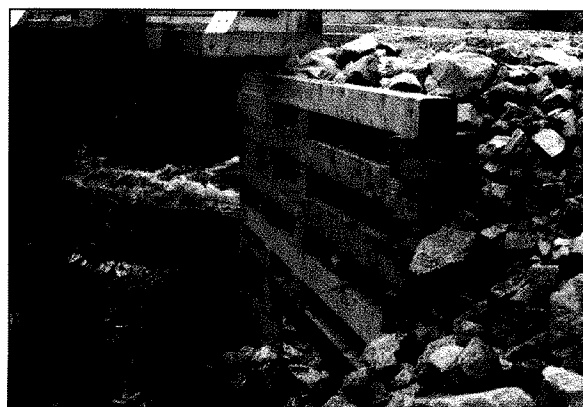
CONSIDERATIONS

- Construction of timber crib structures, if done improperly, can result in degradation of fish habitat. If improper fill of ballast material is used, silt can be released into waterbodies/watercourses, resulting in potential negative impacts on fish and fish habitat. The location of timber cribs could also result in the physical disturbance or loss of fish habitat.
- During all construction and associated activities, the alteration, disruption or destruction of fish habitat (e.g., removal of bottom substrate) in any waterbody should be avoided and siltation kept to an absolute minimum (see Factsheets # 6, 7, 10 and 17 regarding measures to control siltation).
- Shoreline or streambank disturbance should be restricted to the immediate work area. Disturbed shorelines or streambanks must be stabilized by the use of rip-rap, seeding or sodding (see Factsheet # 11 regarding stream bank stabilization in freshwater environments).
- Untreated wood or pressure treated wood is recommended for use in or near freshwater and marine environments. Manually applied wood treatments may also be utilized. Preservatives such as pentachlorophenol (PCP) should not be used in freshwater or marine

IMPLEMENTATION PROCEDURES

In order to avoid damage to fish habitat, the following measures should be implemented:

- Any material used to fill a submerged timber crib structure should be free of fines or sediment (e.g., material such as blasted rock or boulders) to a level above the extent of highest normal water levels.
- Material designated as ballast to fill any timber crib structure should never be removed directly from any watercourse or waterbody, from any shoreline below the high water mark, or from any streambank area.

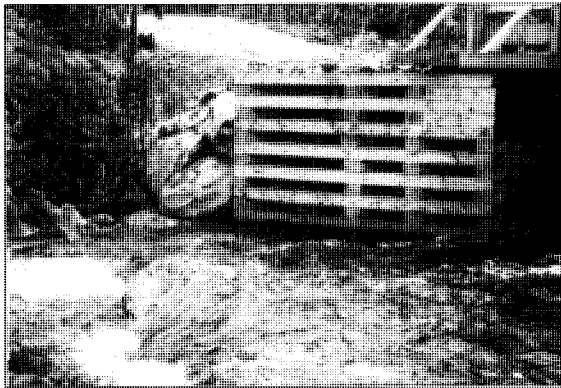


Infill materials for timber cribs.

environments; Creosote should not be used in freshwater but may be used in marine environments; chromium copper arsenate (CCA) can be used in freshwater. Freshly treated preserved wood should be avoided. Environment Canada should be contacted regarding wood preservatives, weathering, and the location of treatment sites for manually applied preservatives.

MAINTENANCE

- Regular maintenance must be carried out on timber cribs to prevent collapsing and possible shifting of the crib or ballast. Any timber crib material moved by ice or wave action should be recovered by the owner.



Timber crib construction: untreated/pressure treated wood.



Timber crib construction for marine environment.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Water & Sewer Lines Stream Crossings

Department of Fisheries and Aquaculture

CONDITIONS WHERE APPLICABLE

The following mitigation procedures/options are recommended wherever lines or pipes of any sort (water lines, sewer lines, communications or power cables, etc.) are to be installed under the substrate of any watercourse.

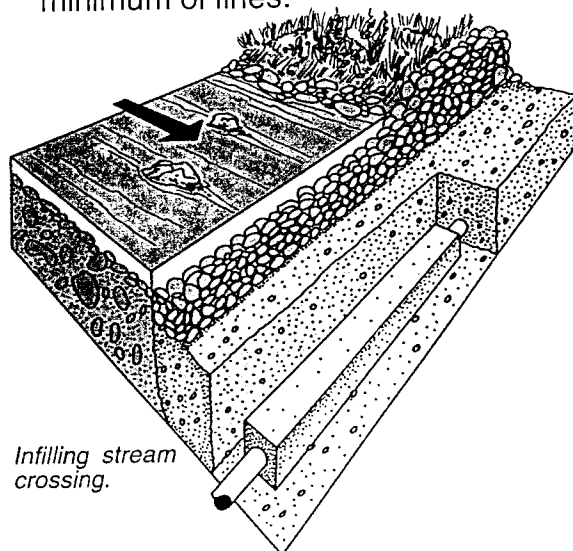
CONSIDERATIONS

- Instream works associated with these types of activities must be carried out in the dry (see Factsheets # 10, 12 and 13 regarding instream work in the dry).
- Silted water arising within work areas should be treated to remove silt prior to release into watercourses/waterbodies. (See Factsheets # 6, 7, 10, and 17 regarding measures to control siltation).
- Stream banks and approaches to or from crossing areas disturbed as a result of these activities should be stabilized immediately after the crossing has been completed (see Factsheet # 11 regarding stream bank stabilization).

IMPLEMENTATION PROCEDURES

- Once the pipe installation has been completed, the "trench" created in the stream bed should be partially filled with suitable materials; these materials can then be compacted and the stream bed brought back to its previous elevation and grade using a 15-20 cm topping of clean

non-erodible materials containing a minimum of fines.



- The materials to be used for the "topping" in the crossing area should be consistent with the material substrate of the stream in this area and should be large enough to resist displacement by peak flows.



Instream excavation for stream crossing.

MAINTENANCE

- Once the stream crossing has been properly completed and the crossing area sufficiently stabilized, regular maintenance is usually not required unless site specific problems arise; any subsequent requirements for excavation should be carried out as noted.



Stream bed restored.

ABANDONMENT

- Excess materials resulting from stream bed/stream bank excavation, mitigation procedures, etc., should be disposed of or stockpiled so as to prevent their entry into any watercourse/waterbody.



Stream crossing completed.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office.



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FACTSHEET

Culvert Installations

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Culverts are the most commonly used method for providing access over a watercourse, and particularly for small and medium sized streams. Several types of culverts are used including; open bottom/bottomless arch, pipe arch, box, and circular/cylindrical. Box type culverts are generally made from wood or concrete while other types are made from plastic, concrete or, most commonly, corrugated steel. Figure 1 identifies various culvert shapes.

Figure 1 Culvert Shapes



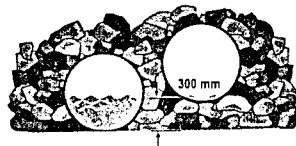
Open Bottom Culvert
Maintains natural bottom substrate. Water velocities do not significantly change.



Box Culvert
Can be designed to accommodate natural stream width.



Pipe Arch Culvert
Good for low clearance installations. Wide bottom area allows for retention of natural substrates



Stacked/Multiple Culvert
Can provide fish passage over a wider range of flows, depths, and water velocities.

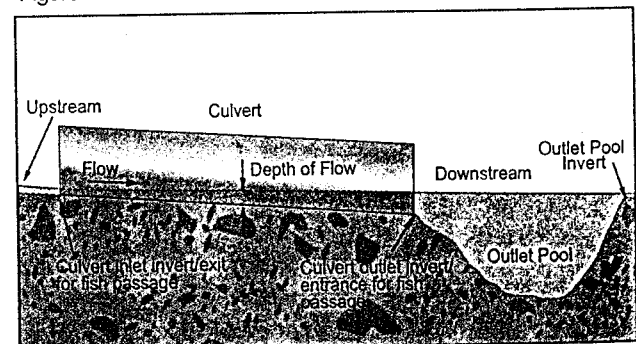


Cylindrical Culvert
If properly designed and installed does not limit fish passage. Can constrict stream width and create high velocities

CONSIDERATIONS

- Sufficient depth of flow and appropriate water velocities for fish passage should be provided in culvert installations.
- Culvert size should be based on the capacity to handle peak flows. It may be necessary to have a hydrologic and hydraulic analysis performed in order to determine the correct size of the culvert to be used. The hydrologic analysis is used to determine the peak flow and the hydraulic analysis is used to calculate the capacity of the culvert to adequately pass the peak flows.
- The type of culvert selected and installed should minimize potential impacts on fish habitat, maintain fish passage, and sufficiently accommodate watercourse flows. To the extent possible, natural stream conditions (i.e., widths, habitat, etc.) should be maintained. Figure 2 illustrates some common terms associated with culvert crossings.

Figure 2. General Culvert Terms



- Natural bottom substrate and hydraulic capacity of watercourses are best maintained using open bottom/bottomless arch culverts; these are the preferred type of culvert crossings.

Culvert Installations

- Footings for open bottom culverts should be installed outside the normal wetted perimeter of the watercourse and tied into the bedrock or sufficiently stabilized to prevent erosion around the footing or undermining.
- For installation of cylindrical culverts in fish bearing streams, a minimum culvert diameter of 1000 mm should be provided and designed/sized according to site specific considerations.
- Cylindrical culverts should be installed to simulate open bottom or pipe arch culverts. Culverts up to 2000 mm in diameter should be countersunk a depth of 300 mm below the streambed elevation. Culverts with diameters exceeding 2000 mm should be countersunk a minimum of 15% of the diameter below the streambed elevation. Note: Countersinking reduces the hydraulic capacity of the culvert, therefore the required diameter of the culvert must be adjusted accordingly (Figure 3).

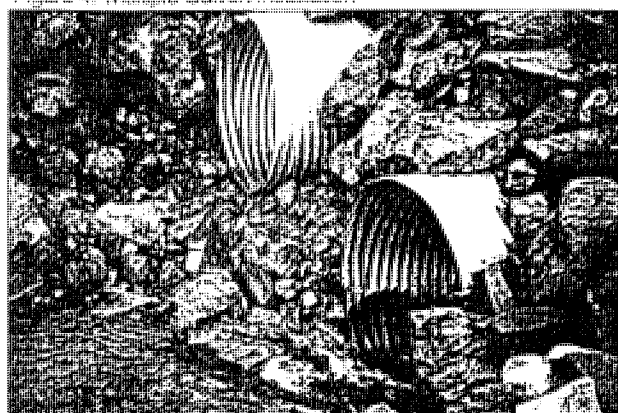
Figure 3. Countersunk Culvert



- Culverts should be aligned parallel to the existing natural channel and located on a straight stream section of uniform gradient.
- The culvert should be placed on firm ground and be countersunk to the appropriate depth. In sites where soft foundations are present the unsuitable material should be removed and replaced by clean granular material to prevent the culvert from sagging. Water movement under or around a culvert installation should be prevented through the use of headwalls, or other means, as necessary.

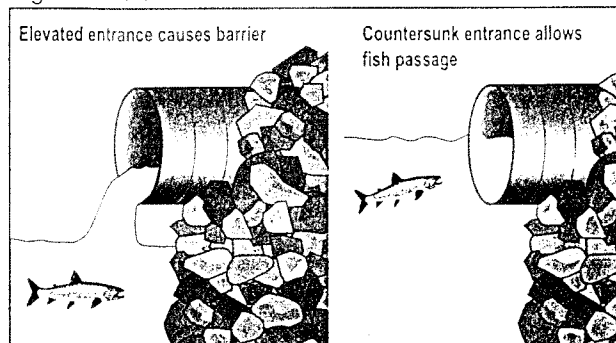
- A culvert should extend beyond the upstream and downstream toe of the fill (eg., a minimum of 300 mm, see Figure 7).
- For multiple culvert installations the culvert intended to provide fish passage should be placed in the deepest part of the channel and be countersunk to the required depth. The remaining culvert(s) should be placed a minimum of 300 mm above the invert of the fish passage culvert. (Figure 4).

Figure 4. Multiple Culvert Installation



- Culverts should be sufficiently sized and installed such that scouring of the outlet streambed does not occur as a result of increased water velocities in the culvert. Elevated culvert entrances can cause scouring which may create an obstruction for migrating fish (Figure 5).

Figure 5. Perched Culvert Entrance

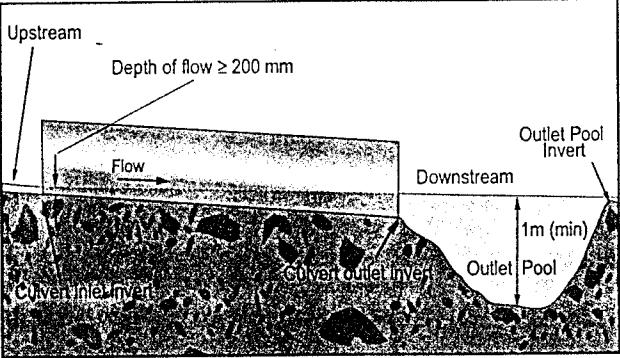


- A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/ downstream pool can be constructed. In some cases, an upstream pool may also be necessary.

Culvert Installations

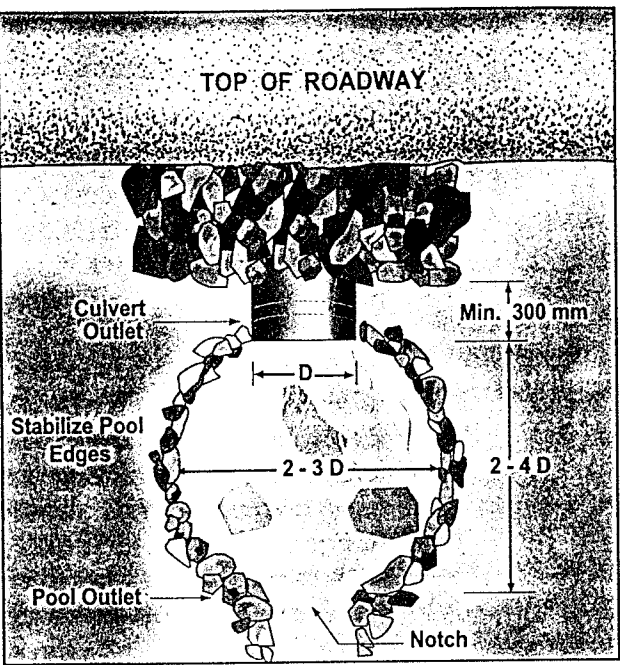
- The invert of the pool outlet should be at an elevation that maintains a minimum of 200 mm of water depth up to the inlet or upstream end of the culvert (Figure 6).
- The culvert slope should follow the existing streambed slope where possible. Excessive culvert slope, reduced culvert capacity due to countersinking and maintenance of the 200 mm minimum depth of flow, and back watering due to the creation of an outlet pool should be considered when selecting the required culvert diameter to allow fish passage and pass peak flows.
- Pools should be designed so that there is a smooth transition of flow from the culvert to the natural stream width.

Figure 6. Outlet Pool



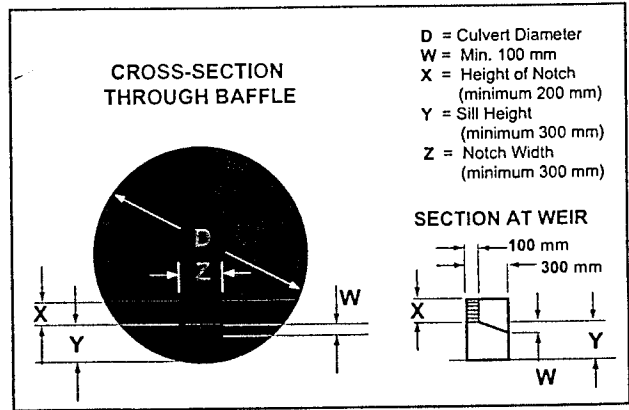
- The natural streambed elevation should be used as the pool outlet invert; however, depending on site specific conditions, a pool outlet may need to be constructed. It is essential that the invert elevation of the pool outlet be stable and, if necessary, well maintained to ensure a minimum water level in the culvert. Clean, non-erodible riprap or gabions should be used to stabilize the pool. The pool outlet may need to be v-notched to enable fish passage at low flow periods. More than one pool may be required.
- Pools should be pear shaped and sized such that: pool length = 2 to 4 times culvert diameter; pool width = 2 to 3 times culvert diameter; pool depth = 0.5 times the culvert diameter, 1 metre minimum. (Figure 7). The culvert diameter referred to the above is that of the fish passage culvert.

Figure 7. Pool Sizing



- For stacked/multiple culverts, pools should be installed with the fish passage culvert orientated to the centre of the pool to allow for a smooth transition of water from the culvert to the watercourse.
- Depending on site-specific conditions (eg., steep slopes, long crossings, constricted streams resulting in high water velocities, etc.), baffles/weirs may need to be installed in the fish passage culvert. Baffles/weirs can provide an adequate depth of flow and reduce the water velocity in the culvert in order to facilitate fish passage. Baffle dimensions should be provided as per Figure 8.

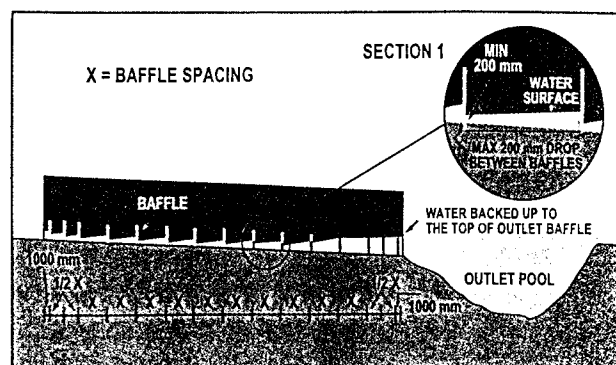
Figure 8. Baffle Sizing



Culvert Installations

- A minimum depth of flow of 200 mm should be provided throughout the culvert and baffled sections. The drops between adjacent baffles should be a maximum of 200 mm.
- Baffles should be placed approximately 1 metre from the inlet and outlet ends of the culvert, the next baffles should be placed at 1/2 the baffle spacing. The remaining baffle spacing should be determined by using the low flow (flow at the time of fish migration, i.e., lesser of flow at 90% exceedance via flow duration analysis or the 7 day, 10 year low flow) as a basis for meeting the above depth of flow and drop between baffles criteria. Baffle spacing should also provide a pool volume large enough to dissipate the kinetic energy produced by the water falling over the weir, and consider high flows (i.e., 10% exceedance based on flow duration) during the fish migration period. Baffle spacing is illustrated in Figure 9.
- The invert elevation of the outlet pool should be set to back water up to the top of the outlet baffle.
- The upstream culvert invert, in some site specific situations, can be countersunk to facilitate depth of flow provided that the head differential is accounted for.

Figure 9. Culvert Baffle Spacing Requirements



Maintenance

Culvert installations should be suitably stabilized to prevent erosion, seepage, and undermining and maintained in good repair and operating condition.

Special Considerations

Modifications of the above criteria/guidance in consultation with the Department of Fisheries and Oceans may be required to address the passage of fish species other than salmon, brook trout, and brown trout in culvert installations.

This factsheet concerning culvert installations is generic and has been developed to apply to a variety of different circumstances. Some site specific situations may warrant modification of the above guidance, as deemed appropriate and in consultation with the appropriate Area Habitat Biologist. In some site specific situations, a professional engineer and/or biologist should be consulted.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office



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Appendix D:

Topographic Map

